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Caring Hay in the Barn ..... *Hoard's Dairyman* 1
The Red Paradox of Conservation ..... *American Forests* 6
The CCC's Work in Conservation ..... *Robert Fechner* 11
Fertilizers Boost Corn Profits ..... *Ohio Farmer* 15
Carotene Content of Alfalfa Hay ..... *Michigan Farmer* 19
Vitamins in Livestock Feeding ..... *American Agriculturist* 20
Trichomonad Disease ..... *Guernsey Breeders Journal* 23
Louisiana's Vetiver King ..... *Farm and Ranch* 26
Fertile Egg Aids Science ..... *American Poultry Journal* 29
Birdsfoot Trefoil ..... *Soil Conservation* 32
Gross Farming System ..... *Capper's Farmer* 36
Chloropicrin Soil Fumigation ..... *Seed World* 39
Calf Feeding ..... *Successful Farming* 45
Temporary Silos ..... *Michigan Farmer* 47
Ki-Yi-Yi-Ki-Yi-Ki-Yoo-oo ..... *Washington Farmer* 50
New Sugar Beet Deal ..... *California Cultivator* 52
Farm Tenantry Can Be Profitable ..... *Nation's Business* 54
National Defense ..... *Southern Planter* 59
New Uses for Fruits ..... *American Fruit Grower* 63
Measuring Logs ..... *Rural New-Yorker* 67
Sexing is Sound ..... *Poultry Item* 71
No Substitute for Soil Fertility ..... *Better Crops* 74
The Digestion of Nutrients ..... *The Book "Poultry Husbandry"* 78
Have We a New Utility Breed? ..... *New England Poultryman* 82
Are They Vermin? ..... *E. Laurence Palmer* 86

# The Farmer's Digest

From more than two hundred magazines and bulletins published in this country and abroad, the Editorial Staff of the Farmer's Digest selects articles of outstanding merit and general interest. It is comprehensive in its scope, covering all phases of Agriculture.


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# The Farmer's Digest

Volume 3 July, 1939 Number 3


## Curing Hay in the Barn

Condensed from Hoard's Dairyman


*C. E. Wylie*

Head of the Department of Dairy Husbandry, Tennessee College of Agriculture


COMMERCIAL hay driers have been on the market for many years. Most of these are adapted to handling large volumes of hay and they require heat in the process. The equipment is large and not adapted to ordinary farm operations.

It is the purpose of this short article to describe a new method of drying hay by the use of air in the barn without heat.

This new process of drying hay in the barn has been developed over a period of four years at the University of Tennessee. It has been a co-operative project with the Tennessee Valley Authority. It is part of a great regional planning project in soil conservation and rural electrification.

When we look over the various sections of the United States we find a great variation in the annual precipitation. There are some states in the West which have an annual precipitation of approximately 15 inches, while there are other sections in the East and the South that have an annual precipitation of from 35 to 50 inches. This rainfall is quite necessary from the standpoint of making crops grow. It is quite a liability, however, at harvest time.

Quite frequently when we get ready to cut hay it is cloudy and we can see a rain is on the way. It is much easier to forecast a rain four to six hours away than it is 18 or 20 hours. In the ordinary sun curing of hay in the field such hay must lie exposed to the weather, either rain or sun, 18 or 20 hours or longer.

By this new system the hay is cut in the morning and allowed to lie on the ground for approximately four hours. This permits a large part of the moisture to evaporate from the plant but still not enough to make the hay shatter or to be low enough in moisture content for safe storing. At this stage the hay, in the case of


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alfalfa, contains 45% to 50% moisture. This hay may then be raked and loaded on a wagon with a hay loader. The ordinary harvesting machinery is used in this kind of hay making. Such hay is quite green in color and is limp enough not to shatter.

This green hay is then hauled to the barn and unloaded with the ordinary forks, ropes, and pulleys which are used in handling any kind of hay. Up to this point about the only variation from field curing has been that the hay has been hauled into the barn earlier in the day than it would otherwise have been brought in. If we take a look into the barn loft we find an entirely different kind of construction. The floor of this loft is tight, with tongue and grooved flooring. On top of this floor is a series of wood air ducts. The system is an adaptation of the ordinary air conditioning of large buildings, such as theaters, to air conditioning of a barn loft. The main duct through the center of the barn is very large. The greater the distance from the place the air enters the loft, the smaller the main duct. This is provided in order to keep the air pressure uniform throughout this system.

The lateral ducts are about 4 ft. apart and extend to within 4 ft. of the sides of the barn. The air is forced out from these ducts at the 1 in. space at the bottom of the duct at the floor. Horizontal ducts seem to be better than vertical ducts because the hay may be piled on top of them. In the case of vertical ducts there will be a tendency for the air to escape around the ducts instead of going through the hay.

Where does this air come from? In this particular barn a fan was installed in a small lean-to building outside the barn. This blower is driven by a 5 hp. electric motor which delivers 12,000 cu. ft. of air per minute. It has required considerable experimental work to reach this point in developing this system. In the early days of these trials the hay was stacked into small piles of 500-1000 lbs. out in the field and air was blown through it. This air was heated because at that time this seemed to be necessary. Smoke was added at times in the air ducts in order to check on the uniform distribution of the air. The next stage included a stationary wagon near the barn on which the hay was dried in quantities of approximately one ton. This was followed by a small section of the barn being equipped with air ducts and finally the present system which includes one wing of the barn 36 ft. wide and 40 ft. long.

In developing this experimental plan it has been necessary to check on various things to determine what was taking place in the

loft. Moisture tests were made of the hay. Hundreds of samples were tested to determine how much water should be removed in the barn, also to determine when the hay was finally dry enough for safe storage. This was quickly determined by the use of toluene. Approximately 20% moisture, which is the usual amount considered safe for storage in field curing, was found to be satisfactory in these trials.

Another thing which was necessary to check was the temperature of the hay. It is well known that hay which is not completely cured in the field will heat when stored in the barn. Such hay may pass through a heating process which may greatly reduce its feeding value and in some cases may cause spontaneous combustion. A series of thermometers were placed in the hay loft being buried 6 feet in the hay in order to determine the temperature. It was found that this green hay would quickly heat but that starting the air blower would quickly reduce the temperature of the hay and on account of the evaporation of moisture the hay loft was at a lower temperature than the outside air. It was thought at first that it was necessary to keep the fan going all the time, day and night, but it was finally found that this was not necessary but that the fan could be run periodically.

There were two things which determined when the fan should be run. These were the temperature of the hay and the humidity of the outside air. A thermostat was attached to the motor so that it would start the blower automatically whenever the hay reached a temperature as high as 102 degrees F. A humidistat was attached outside the barn so that the blower would start whenever the humidity was low enough to dry the hay. Accordingly it was found of little use to run the blower at night because it had little effect in drying the hay. However, the hay would usually heat some during the night and the blower would be started and run possibly a half hour once a night.

Two crops of hay have been cured in this barn. It was found that it was possible to reverse the flow of air so that part of the time the air was forced upward through the hay from the floor and at other times it was drawn down through the hay from the air above the hay. So far the depth of the hay on one series of ducts has been from 10 ft. to 12 ft. In harvesting the hay several loads of hay may be placed on the ducts one day and another lot placed on top of this the following day. The blower is run to reduce the moisture content or whenever it is necessary in order to reduce the heat in the hay.

The quality of this hay has been checked by various methods. This hay has been produced by the Tennessee Agricultural Experiment Stations at Knoxville and Jackson and at other locations in the South. Federal hay grading officials have graded it one grade higher than hay sun cured from the same field. It has been checked by rats for carotene content and found that it contains carotene. Sun curing tends to destroy carotene in the plant after it has been cut. Chemical analyses of this hay for the past season showed considerable more carotene in this hay than in the field cured hay. Other constituents were also checked chemically.

Several feeding trials have been run on this hay comparing the field cured with the air dried hay. In the early trials there seemed to be little difference in the growth of animals. The later trials with the improved blower system show growth results much more favorable for the air dried hay. This was especially true in the trials run thus far on the growth with dairy heifers. This included heart girth, skeleton growth and weight. In all cases these heifers have bred normally. The group of heifers which were wintered a year ago on the air dried hay have calved this winter and are making a splendid growth and production.

Perhaps these feeding trials still do not show the real comparison between field cured hay and hay dried in the loft. The field cured hay was not damaged by rain. There are many sections of the country which have quite a large amount of hay damaged each year by rain. It is well known that the rain leaches out a large part of the protein and other constituents. This is very serious when we consider that the protein which is leached out includes such a large proportion of the digestible protein in the plant. A comparison of these two systems of hay curing, including hay damaged by rain, will probably show a much greater difference in the two kinds of hay than has been shown up to the present time. That air dried hay is more palatable than field cured hay is shown by the fact that cattle will eat more of it when given free access to it. The leafiness and the color of the hay are quite marked even to the casual observer.

Since the actual harvesting requires the ordinary harvesting machinery used for this purpose, no consideration has been given to the cost of handling the green hay. While more weight is handled in the green form it must be recognized that in the case of rain it is frequently necessary to turn the hay one or more times in the field before it can be brought into

the barn. The blower, the motor, and the wood ducts in this system cost approximately $300 installed in the barn. The only expense of operating the system is for electricity which, at 2 cents per kilowatt hour, cost approximately 90c per ton during the past two years. A twenty minute shower could probably damage hay much more than this in field cured hay.

While this system of drying hay is still in the experimental process it has created a great deal of interest on the part of many people, including those engaged in agricultural research. Its adaptability to farm use is one of its interesting features. Its low cost of operation appeals to everyone. The palatability of the hay and its nutritional results seem to indicate that it is a superior hay. It is the plan to continue the further development of this system of air drying hay and check the results of the quality of the hay by chemical and feeding trials.

## Lasting Quality of Wood

ONE of the recent interesting questions asked of the U. S. Forest Products Laboratory, Madison, Wis., was whether all wood in the course of time "naturally" decays as a result of time or age. Time or age in itself has nothing to do with wood decay is its answer.

This notion ignores the true cause of decay and may lead the user to neglect proper precautions against it. Time or age in itself has nothing to do with the decay of wood. The White House, when remodeled in 1928, was found to contain sound roof timbers that had been in place since 1816. A log seven feet in diameter was found not long ago in a tunnel being dug 150 feet below the bed of the Yakima River, in Washington. A piece of it was sent to the Forest Products Laboratory and the wood was identified as an extinct species of sequoia, of an age estimated by geologists at 12 million years.

These examples prove that wood does not necessarily decay with age at all. Decay is the result of one thing only, and that is the attack of wood-destroying fungus. In the cases mentioned the wood had been kept free of fungus attack in one of two ways: It had been kept dry, as in weatherproof structures or in a dry climate, or it had been kept thoroughly and permanently saturated. A fungus is a plant. If the wood is too dry for it to grow and spread, decay does not occur. If the wood is thoroughly saturated, the fungus is "drowned out."—*The Farmer*

# Forest Fire — The Red Paradox of Conservation

Condensed from American Forests

*W. B. Greeley*

Secretary-Manager, West Coast Lumbermen's Association

ON August 14, 1933, in an upper reach of Gales Creek, Tilamook County, Oregon, two logs rubbed together. One was a Douglas fir, on its way to the landing. The other was a cedar windfall, tinder dry. A high wind was blowing from the northeast. Sparks popped from the friction of the two logs into dry logging debris, and the wind fanned them into small tongues of flame. Smoke spiraled upward.

Like all major disasters, the Tillamook fire seemed to be managed by some malignant power of fate. It started at noontime. The operation was closing down because of fire danger. Conditions were plainly bad. The fire spread with explosive force, despite the efforts of loggers and other experienced fire fighters; and before nightfall it had covered 400 acres. The area was very rough and lacked trails. By nightfall of the second day the fire had spread over about ten sections. There it was held until August 20, when the wind again blew hard from the east and the humidity fell. The fire marched westward, spreading over 40,000 acres. On August 25 the fire blew up. Within forty hours, from midnight of August 24 until the evening of August 26, a tornado of flame swept twenty miles to the west and ten miles to the south. It brought smoky night to the region, and carried clouds of ashes to the sea.

The area burned in the Tillamook fire was 244,706 acres. The volume of timber killed was 10,257,517,000 board feet, nearly three times the West Coast cut in 1933. This was one of Oregon's finest timber stands. Six years of direct employment for 14,000 men and a loss in lumber values alone of $275,000,000 went up in smoke. The burned timber would have built one million small homes.

The Tillamook burn, although some timber has been salvaged

Reprinted by permission from American Forests, Washington, D. C., April, 1939

and much of the area is reforesting, remains a monumental testament to the red paradox of the American conservation movement. After forty years of conservation, we must admit defeat at the hands of conservation's chief enemy—the forest fire. This is a harsh statement, in view of all the splendid progress in organized fire prevention, public and private. But the hard facts speak for themselves.

The spectacular forest fire disasters of the past seventy years are a terrible record of loss of human life, and of destruction of mature timber, timber crops, improved property and communities. However, the most discouraging side of the forest fire picture is not in spectacular disasters which are publicized on the front pages of the newspapers for a brief period and then forgotten. The red blot on conservation is the annual tens of thousands of typical forest fires which get comparatively little attention, especially those in young growing forests which the public has not been taught to appreciate. These fires represent the conservation movement's most inexcusable failure, because they are generally subject to control.

The forest fire statistics of the federal Forest Service for 1937 provide substantial evidence. The year 1937 was a "good" forest fire year, on the basis of five-year averages. It yielded *only* 185,000 forest fires in the United States, Alaska excluded. They burned over *only* 22,000,000 acres of land, or but a little more than half the acreage burned in 1936. More than eleven per cent of the total unprotected forest area of the country was burned over; and ninety-four per cent of all acreage burned over was *unprotected* forest land. The bill of damages on the 1937 unprotected acreage burned is stated by the Forest Service as $18,202,740.

Viewing the situation over a term of years, the record shows that during the five-year period, 1933 to 1937, the number of forest fires which occurred in the United States, Alaska excluded, averaged just short of 172,000 a year, and that the average acreage burned amounted to 36,327,754 acres with total yearly damage of approximately $43,000,000.

In the *protected* forest area of the United States, the Service reports an annual average of 66,752 forest fires, of which 4,175 were started by campers; 16,282 by smokers; 16,487 by incendiarists; 9,126 from debris burning; 5,813 by lightning; 1,207 from lumbering. The latter caused two per cent of the total fires; while campers, smokers and arsonists caused fifty-five per cent; lightning, nine per cent; and debris burning, or land clearing, fourteen per cent. Railroad fires, a little more than

four per cent of the total, and fires of miscellaneous and unknown causes make up the remainder.

In 1937 and again in 1938, 140,000,000 trees were planted on 155,000 acres of national forests; more than 150,000 acres planted —but the annual fire loss is 287,000 acres on those forests.

What does it profit conservation to plant new timber crops while failing to control fires that burn an area a third larger than that planted?

The forest industry of western Washington spent more than $800,000 for fire control and the production of new timber crops in the year 1937. The 1938 record shows the effect of that expenditure. Of the state's 2,197 fires, only fifty-seven originated in lumbering operations, or less than three per cent. There were 722 smokers' fires; 148 campers' fires.

The lesson of all these statistics is that the forest fire problem is a public problem. Solution of the fire problem should be the first order of business for the conservation movement. Putting these two points together, it logically follows that *the big job of conservation today is in the field of public responsibility for forest fires.* Forest industry, in at least much of the country, is doing more than its part in forest-fire prevention. The Forest Service and State forestry departments are doing a wonderful job of fire protection on lands under their jurisdictions. The great failure lies on the public side, with the campers, the smokers and the land clearers, and with law enforcement agencies that have failed to halt the incendiarist in the forest.

The root of the problem is public indifference and ignorance. *There is no public will to prevent forest fires,* as there is, for example, to preserve wildlife, because the public has not been educated in the realities of fire control.

Education of the public in forest-fire responsibility and control has been pushed hard on the West Coast, yet it is notoriously true in this region that a "stump rancher" may be jailed three months for shooting a deer out of season to feed his family, and yet be fined no more than five dollars, if at all, for burning debris on his land without a permit, in violation of the law, and often with the destruction of adjacent growing timber. The smoker or the camper who starts a forest fire seldom suffers more than inconvenience *if* he is caught by law officers. Of the State of Washington's 2,197 forest fires in 1938, 436 were incendiary fires. To date not one of the criminals responsible for those fires has been brought to book. Smokers and campers who start fires are

also violators, for if they obey the regulation, they do not start fires.

Public opinion must be aroused in behalf of fire control before there can be better enforcement of fire protection laws. At present public opinion is passive to the vast majority of forest fires, and may be excited—and then only temporarily—by spectacular forest disasters. As human psychology goes in other fields, it is reasonable to presume that the spectacular side of forest fire devastation has been so played up that the public is dulled to the destruction wrought by the hundreds of thousands of unspectacular surface fires.

The attempt to teach the public fire protection in terms of a circus of horrors might well be abandoned. It hasn't worked, according to the factual evidence. The net result has been to create in the public mind a picture of the only real forest fire as an inferno amid giant trees, and to shut out the common picture of the surface fires speading undramatically through growing crops of timber. The proof of this effect is in the familiar fact that the average visitor to the forest will take great precautions with fire in virgin timber, where fire danger is lowest, and take few if any precautions in cutover or in second growth, where it is highest.

Two reports, each written for a radio broadcast, on the Toandas fire of last year on the Olympic Peninsula, now lie before me. One reads:

"There are about 5,200 acres in this fire. It is about eight miles long and a mile wide. The entire area has been cut over at least once, some of it as early as 1870. About half has been recently logged or relogged for poles, piling, shingle bolts and other small material. The areas of oldest cutting contain very fine stands of second growth. This second growth meant future wages, future homes, future business, and future cargoes for the steamship lines and the railroads of the Pacific Northwest."

This was written by a forest engineer. There is material in it for sober education. But note what was done with it for the broadcast, in the conventional way of publicizing forest fires:

"Looked at from the air, it just seems as if some terribly horrible demon or gigantic fire moth was busy at the blanket of forest that lies underneath. It's one of the most needlessly destructive things from a scenic point of view that human ingenuity could conceive of. It turns a country that has all the green lovely lusciousness of a wilderness forest into what is nothing short of a terrible desert, a charnal house that is filled with a giant jackstraw of blackened timbers lying askew,

twisted, torn, broken. . . ."

And so on. Somewhat in this fashion forest-fire facts are commonly turned into sensation, a thrill for the public. A possibly better method would be that which has had long trial with Department of Agriculture bulletins for farmers. These have worked. Circus publicity education of the public on forest fires has not worked. Why should not all of us in the conservation movement get together in creating a series of bulletins on forest fires for national distribution? A series which would be accepted everywhere as authoritative material because all agencies have joined in publishing it?

Timber is a crop. One-fourth of the land area of the United States is fit only for the growing of timber. To keep this part of our land productive in the only crop it is fit to grow, it is vitally necessary to provide real fire control. Fire is the enemy of the young forest, of growing timber, just as the boll weevil is the enemy of cotton, just as the corn-borer is the enemy of corn, and as drought is the enemy of all farm crops. Science may solve the problems of the boll-weevil and the corn-borer. Drouths must be left to Providence. The solution of the forest fires problem rests almost solely with the public.

### Six Rules for Preventing Fire in the Forests

1. *Matches*—Be sure your match is out. Break it in two before you throw it away.

2. *Tobacco*—Be sure that pipe ashes and cigar or cigarette stubs are dead before throwing them away. Never throw them into brush, leaves or needles.

3. *Making Camp* — Before building a fire scrape away all inflammable material from a spot five feet in diameter. Dig a hole in the center and in it build your camp fire. Keep your fire small. Never build it against trees or logs or near brush.

4. *Breaking Camp* — Never break camp until your fire is out —dead out.

5. *Brush Burning*—Never burn slash or brush in windy weather or while there is the slightest danger that the fire will get away.

6. *How to Put Out a Camp Fire*—Stir the coals while soaking them with water. Turn small sticks and drench both sides. Wet the ground around the fire. If you can't get water stir in dirt and tread it down until packed tight over and around the fire. Be sure the last spark is dead.

# The CCC's Work in Conservation

by

*Robert Fechner*

**Director**

FEW persons are aware of the tremendous impetus given to conservation in this country by the launching of the CCC program. The average person, judging from the letters which reach my office, and the articles constantly appearing in the daily press, is well aware of the fine things that the CCC has done for young men in the way of furnishing them healthful outdoor employment and work training. So much has been written about the life in the CCC camps, the education and job training program, the weight gains registered by new enrollees, and the disciplinary and citizenship training value of the Corps, that the welfare and man-building values of the Corps are no longer questioned by even the most avid critic of the administration. At the same time, however, all CCC officials feel that in our enthusiasm for CCC youth benefits, we should not lose sight of the outstanding work accomplishments of the young men and war veterans sent to the camps.

Anyone who takes the trouble to examine Federal and State records for the last twenty years showing trees planted on public lands, work done to control erosion on agricultural lands, improvements built to strengthen forest fire protection systems, and steps taken to improve recreational facilities in our forests and parks, will be amazed by the little that was done in these fields in the thirteen years prior to the launching of the CCC program and the huge amount of work accomplished during the last six years with CCC funds and labor. It is no overstatement of the situation to say that the major work accomplishments in conservation over the last few years may be credited to the young men and war veterans of the CCC.

When the Civilian Conservation Corps was formed the War Department, the Department of the Interior, the Department of Agriculture and the Department of Labor were directed by Executive Order to co-operate fully in the administration of the new program. The Department of the Interior and the Department of Agriculture were instructed to make arrangements to employ large numbers of young men and

war veterans on conservation projects. The two departments accepted the new assignments enthusiastically. For years they had sought appropriations needed to safeguard the forests and soils but never before had they had enough money even to make a good beginning on the huge reforestation, improvement and recreational development programs facing them.

The Department of Agriculture immediately began working out plans for strengthening the forest protection system by building truck trails and fire lookout towers and extending lines of communication. They laid out tree planting programs on an unprecedentedly large basis. Simultaneously the Department of the Interior pushed forward preparations for utilizing CCC enrollees, for protecting and improving the national parks and for expanding the state park system.

As a result, in the past six years, several vast conservation programs have been inaugurated or materially advanced through CCC co-operation. Among these are such programs as reforestation of waste lands, soil conservation and erosion control, conservation of grazing lands on the public domain and development of State Parks, National Parks and recreational areas for the public. These are but some of the conservation programs in which the CCC has co-operated. Underlying each of these programs has been the need for labor, and in these programs as a whole more than three-quarters of all the labor used has been furnished by the CCC.

Let us take the program of soil conservation and erosion control as an example, and show the part played by the CCC in this one phase of conservation.

When the Soil Conservation Service started work about five years ago the idea was to set up some large scale demonstrations throughout the country; not just one or two farms but a whole group of farms comprising a complete watershed, if possible. The effort was to put soil conservation practices into effect out where the farmer could see and study them under everyday conditions. This was sensible and practical, but it quickly became evident that to accomplish this more help was needed than the farmers could furnish. Furthermore, that more demonstrations than had been originally planned were needed if the program was to be a benefit to the farmers as a whole.

Speaking broadly, the CCC's part in this program has been to fill these two evident needs of the Soil Conservation Service.

The CCC has an enrollment of 300,000 young men and war veterans. It furnishes man-power to eighteen Federal and State

supervising agencies engaged in conservation work. The Soil Conservation Service is one of these agencies, and as soon as this Service's need for labor became apparent, a suitable number of CCC camps was put under its supervision. Young men from these camps furnished the needed additional labor; and at the same time, the farm lands surrounding each camp became work areas where soil conservation practices were demonstrated.

The number of CCC camps under Soil Conservation Service direction has varied from year to year. At one time, there were as many as 500. Today, there are 360. But during these years, excepting for the work done by the farmers themselves, 70% of all the labor used by the Soil Conservation Service in its program of land use demonstration has come from the CCC.

To most farmers, of course, erosion in the form of gullies was an old story. To the average man gullies and galled spots, deforested hillsides and washed-away farms were a natural and necessary evil. Few realized that they were a man-made menace that could and was being eliminated by the men of the CCC. The realization that the CCC erosion program was proving successful brought a public reaction of enthusiasm for the work that gave a tremendous impetus to the cause of soil conservation. Dr. Hugh H. Bennett, Chief of the Soil Conservation Service, has stated on more than one occasion that the CCC is responsible, in a large measure, for the rapid advancement of the Soil Conservation Service program.

Gullies, though spectacular, are just one small part of soil conservation work and are not so devastating to the land as sheet erosion which, almost unnoticed, washes farms down into the streams. Here is where the battle must be won or lost—not in plugging gullies, but in developing a land use program that will save the soil and, at the same time, permit profitable use.

The Soil Conservation Service has realized this from the first, and it has been in the demonstration of an adequate land use program that the CCC boys have played such an important part.

Back of every soil conservation farm plan goes a lot of foundation work based on engineering; for though it has been demonstrated that the probable solution to the erosion problem is proper vegetative cover, it has also been proved that this vegetative cover cannot check erosion unless it is applied over a framework or foundation of land planning based on sound engineering knowledge and principles. To do this, maps of watershed areas and individual farms have to be made. Terraces

—contour and grade lines must be established. Fences built or relocated. Roads need to be changed on occasion. Water outlet channels must be dug—graded and vegetated.

All of these steps are but the foundation of a well planned land use program. And when today you view the conserved farm, where erosion has been reduced to a minimum, this foundation work is often overlooked, and only the gratifying finished results observed. However, these results rest on that foundation work which is the fruit of endless man-days of labor supplied by CCC enrollees working under the technical direction of soil conservation foremen.

And just what are the *results?* Are they only the improved acres we see as we drive along the road from time to time? If that were all, beneficial though it is, the soil conservation program would be falling short of its mark. But fortunately that is not all.

To every demonstration area come hundreds of farmers from without the area itself to see these land use programs in practice. They see that losses on their own farms can be prevented. They study the work and get advice on proved methods which they take back and apply on their own land. They do more than that. They band themselves together and under laws passed by the State legislatures organize districts for conservation of the soil.

This whole idea of soil conservation has spread by leaps and bounds through this demonstrational method. Here's an actual example of how it worked in the mid-west.

Back in August, 1935, the Soil Conservation Service decided to locate a demonstration area in the Northeast corner of Arkansas. A CCC camp was built at Pocahontas, and 200 CCC boys moved in. Farmers in the immediate area of the camp were asked to co-operate with the Soil Conservation Service, and the enrollees from the camp began work on the farms of those who complied with the request. There were not so many farmer co-operators at first; but the sight of the enrollees engaged in the many conservation jobs they had to do, attracted attention. Soon, there were farms with at least much of the foundation work finished. Neighboring farmers came to see what the CCC boys had been doing. They examined the work and saw the practices functioning to advantage. More farmers signed up as co-operators and, by the end of a year, there were about 120 of them co-operating in this demonstration on some 20,000 acres. Not a very large start, but interest had been aroused and there were now finished demonstrations to be seen. Other farmers from

outside became interested. A soil conservation association was organized. The whole country became alive to the idea. Farmers started agitation to get adequate laws passed. Then in 1938—just two and a half years after the camp started work—farmers in that part of the State, acting under a new State law, organized the Tri-River Soil Conservation District. Altogether, more than 350,000 acres in two large counties, are included in this district. Instead of 120 farmers, there are now more than 1200 going ahead with active soil conservation work; and Dr. Bennett, in a recent Radio talk, agreed that this whole big movement could be traced back to the work of that one CCC camp. Furthermore, this expansion is going on all over the country.

Twenty-nine states have passed conservation district laws and in twenty-five of them 126 districts have already been formed. This comprises approximately 66,000,000 acres of land. In addition to this, agreements of understanding have been signed with sixty-eight other districts comprising some 30,000,000 acres.

It is a result of which the Soil Conservation Service as well as the CCC, may be justly proud; and an expansion in which CCC co-operation is needed more than ever before.

# Fertilizers Boost Corn Profits

**Condensed from The Ohio Farmer**

*R. M. Salter*

THE most valuable crop grown in Ohio is corn! Yet the long time average yield of corn in Ohio is only 38 bushels. Rural economists tell us that it costs about $16.00 an acre to grow corn up to harvest. This figures to 42 cents a bushel on the average yield. At present corn prices this doesn't promise much profit for the grower who produces only average or below average yields.

On the other hand, many of the costs of growing corn, such as land rent, seedbed preparation, planting and cultivation, are flat charges and do not increase with the acre yield. This means that farmers who are able to step up their yields above the average level have a much better chance to reduce the cost per bushel. Applying fertilizer is one way of doing this.

Four years' results from Experiment Station tests in nine Ohio counties show 16 bushels

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increase from 150 pounds of fertilizer costing $2.75 to buy and apply. In these tests the added cost up to harvest of each extra bushel produced by fertilizer was only 17 cents.

But high corn yields are not produced by fertilizers alone. To pay best returns fertilizers must go hand in hand with other practices of good corn culture. For example, it doesn't pay to feed high grade plant food to scrub corn. High yielding, adapted corn hybrids are now available to corn growers in all sections. These improved corns can be expected to use plant food more efficiently supplied in either commercial or natural forms. Early plowing to conserve moisture, thoro seedbed preparation, timely and accurate planting, effective weed control thru proper cultivation are all as essential to high yields as is a plentiful supply of crop nutrients.

A 60-bushel corn crop removes from the soil 90 pounds of nitrogen, or as much as in 4500 pounds of a 2-12-6 fertilizer. It also removes 25 pounds of phosphoric acid, equivalent to that in 210 pounds of 2-12-6, and 50 pounds of potash equal to that in 830 pounds of the same analysis. It is obvious that, except for phosphoric acid, only a small part of the total plant food requirement of such a crop would be provided by any reasonable application of 2-12-6.

This emphasizes the fact that with general crops like corn, fertilizers are properly used as supplements to the supply of plant food coming from the soil and from animal and green manures. They are of special value in supplying available nutrients at critical periods when, due to insufficient bacterial action in the soil, the amount released from other sources is not enough to meet the needs of the crop. Such shortage is apt to occur early in the season, especially on light colored soils low in humus, on coarse textured soils after an open winter with much leaching, on cold, wet clay soils, or on most any soils in a cold backward spring. From this standpoint it is easy to understand why the method of distributing the fertilizer and time of application may greatly affect its efficiency.

The once common method of applying fertilizers broadcast for corn has now been largely discarded in favor of hill or row applications. In fact, extensive studies made in recent years have demonstrated quite conclusively that for practically any crop planted in hills or rows, the most efficient use is made of fertilizers placed just as close to the seed as is possible without impairing germination of the seed or burning the seedling roots.

In experiments with corn at Wooster, best results have been

obtained from applying fertilizer in narrow bands on each side of the seed and separated from it by at least three-fourths inch of fertilizer-free soil. Bands placed at or slightly below the seed level have been slightly better than bands at shallower depth, especially in dry seasons. When fertilizers are thus placed in the hill or row for corn, the use of supplementary broadcast applications has been both unnecessary and unprofitable.

Fortunately, most of the better makes of corn planters today are now supplied with improved fertilizer depositors which put the fertilizer where it belongs and which are entirely safe for normal rates of application.

Without fertilizer, corn often gets off to a poor start because the soil contains too little available plant food. When this occurs, the whole development of the crop is delayed, for, regardless of how favorable later conditions may be, the crop silks out later and matures later. Hill or row applications of fertilizer place a supply of available plant food at the disposal of the young plant, and corn so treated usually makes more rapid early growth, silks sooner and matures earlier. In this regard, they are more effective than broadcast applications of manure or fertilizer, even tho the latter supply several times as much total plant food.

Rapid early growth also makes it easy to get the jump on the weeds by early cultivation. In the Wooster tests it was also discovered that hill fertilized corn suffered less injury from white grubs in years of severe infestation. Early maturity helps in protecting the crop against frost damage in the fall, and may, by permitting the growing of later and higher yielding strains of corn, increase the potential corn yield. It is true that in dry years, hastened early development may increase the damage from midsummer drought, but under Ohio conditions, the benefits in other years appear to overbalance the occasional unfavorable effects in dry years.

Higher market quality and feeding value are important benefits from fertilizing corn in Ohio. A surprisingly large part of the corn grown in Ohio is of low quality, chiefly because it fails to mature properly. Even in the best corn years, inspection records of the Toledo market show that only one car in five is likely to grade U. S. No. 4 or better. Early in the market season, high moisture is the chief cause of corn grading low; later low grade is largely due to mold, resulting from storage of too moist corn. Proper fertilization is probably the best means for eliminating the soft, sappy ears of corn, those with chaffy kernels and rubbery

cobs, which add little to any corn grower's pride or profit.

Field studies on the fertilization of corn are being conducted at many points in Ohio by the Experiment Station. Results obtained in 1934, 1935, 1936 and 1937 in nine counties on unmanured land are shown in Table 1. Similar results for manured land in five counties are shown in Table 2.

**Table 1. Returns from Applying 150 Lbs. 2-12-6 in the Hill for Corn on Unmanured Land (4-year average)**

| County | Unfertilized Yield | Increase for 150 Lbs. of 2-12-6 in hill |
|---|---|---|
| | Bu. | Bu. |
| Belmont | 52.1 | 24.1 |
| Washington | 49.5 | 13.3 |
| Meigs | 21.6 | 25.6 |
| Clermont | 21.9 | 20.1 |
| Hamilton | 34.4 | 9.9 |
| Miami* | 60.1 | 8.6 |
| Mahoning | 31.5 | 18.7 |
| Trumbull | 43.1 | 15.5 |
| Madison* | 40.6 | 8.6 |
| Average | 39.4 | 16.0 |

*0-14-6 used in these tests

**Table 2. Returns from Applying 150 Lbs. Fertilizer in the Hill for Corn on on Manured Land (4-year average)**

| County | Yield, Manured Land, No Fertilizer | Increase for 150 Lbs. of Fertilizer in hill |
|---|---|---|
| | Bu. | Bu. |
| Wayne* | 59.2 | 10.6 |
| Washington | 64.6 | 6.6 |
| Meigs | 47.2 | 8.0 |
| Madison | 49.0 | 4.3 |
| Miami | 67.3 | 10.2 |
| Average | 57.5 | 8.0 |

*6-year average

2-12-6 used in Wayne, Washington and Meigs Counties

0-14-6 used in Madison and Miami Counties

The average increases of 16 bushels on unmanured land (Table 1) and eight bushels on manured land (Table 2) from 150 pounds of fertilizer costing about $2.25 are pretty good evidence that it pays to fertilize corn in Ohio, especially when we consider that in these tests a legume sod was plowed down for corn in all cases.

Numerous field experiments have shown that phosphoric acid and potash are both important in fertilizers for corn regardless of soil type and whether manure is used. Nitrogen seems to be generally of less importance, altho usually profitable on light colored soils, with the possible exception of some of the stronger light colored soils in Western Ohio. As a general rule, the 2-12-6 meets most of the requirements for light colored soils, and the 0-14-6 for dark colored soils except peats and mucks where a higher potash analysis such as the 0-12-12 or 0-10-20 is preferable. Four-year average yield increases for 150 pounds of 0-20-0, 0-14-6, and 2-12-6 applied in the hill in experiments in the nine counties listed in Table 1 are shown in Table 3.

**Table 3. Comparison of Different Fertilizer Analyses Applied in Hill to Corn**

| Treatment | 4-year Average Yield Increase | Cost of Fertilizer |
|---|---|---|
| 0-20-0, 150 lbs. in hill | 7.1 | $1.61 |
| 0-14-6, 150 lbs. in hill | 14.9 | 5.35 |
| 2-12-6, 150 lbs. in hill | 15.5 | 5.50 |

*How Much Fertilizer?*

Experiments have shown that it is seldom profitable to apply more than 200 pounds of a 20 unit fertilizer such as an 0-14-6 or 2-12-6 in the hill for corn. In fact, even on light colored soils 150 pounds per acre is probably a better standard for hill application, and on dark colored soils this may well be reduced to 125 pounds. For row application with drilled corn there is evidence that somewhat larger applications are required for most profitable returns. On light colored soils 200 pounds and on dark colored soils 150 pounds are suggested as desirable rates.

Considerably more than half of the corn grown in Ohio in 1939 will be corn hybrids. Since the hybrid strains being grown in the state yield perhaps 10 to 20 per cent more than ordinary open pollinated varieties, the question is often asked, "Should hybrid corn be fertilized more heavily?" This question has not yet been answered experimentally. The extra investment in seed and the increased production per acre certainly justify special attention to adequate fertilization.

# Effect of Method of Curing Alfalfa Hay on Carotene Content

**From The Michigan Farmer**

| Date | Sampled | Hours After Cutting | Carotene Content When Cured in the Swath gammas | Windrow gammas | Cock gammas |
|---|---|---|---|---|---|
| August 3 | 10 a.m. | 0 | 270 | 270 | 270 |
| 3 | 12 a.m. | 2 | 225 | 225 | |
| 3 | 2 p.m. | 5 | 210 | 210 | |
| 3 | 8 p.m. | 10 | 160 | 175 | |
| 4 | 5 p.m. | 19 | 152 | 180 | |
| 4 | 11 a.m. | 25 | 147 | 165 | 165 |
| 4 | 3 p.m. | 29 | 125 | 175 | |
| 5 | 12 a.m. | 72 | 85 | 135 | 120 |
| 7 | 12 a.m. | 120 | 65 | 110 | 120 |

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# Vitamins in Livestock Feeding

Condensed from American Agriculturist

*L. A. Maynard*
Cornell University

IT is not surprising that many regard this subject of vitamins as a rather hopeless puzzle. Fortunately, from the standpoint of animal feeding, we don't need to bother our heads about many of these things that are puzzling the expert. Our immediate interest lies in the facts which have been shown to have direct application in feeding practice.

A definite recognized vitamin is one that has been proved to be an essential constituent of the diet of one or more species. It is important to bear in mind that all which are known are not required by all species. There is no justification for feeding a given vitamin to a cow simply because it has been shown essential for a rat or chick. The needs of each class of animals must be specifically determined. Thus in feeding any farm animal, the first question which occurs regarding a specific vitamin is whether it is actually needed in the ration of the particular animal. If this is the case, the further question arises as to whether the vitamin is likely to be deficient in the rations commonly fed. The vitamin becomes of practical importance only if the answer is "yes" to both these questions. Judged on this basis, so far as we know at present the only vitamins requiring attention in the practical feeding of farm animals, other than poultry, are A and D.

A deficiency of vitamin A is one of the causes of slow growth and general unthriftiness. Various internal troubles result which in their advanced stages cause very evident external symptoms. "Night blindness" (inability to see in a dim light) is an early indication in cattle even as it is in man. In pigs, stiffness, a wobbly gait, and spasms are characteristic symptoms. Vitamin A is absolutely essential for reproduction. This is true for both sexes. In the male a deficiency of the vitamin causes a breakdown of the testes and thus a loss of fertility. In cows, ewes and sows, the deficiency results in a failure to come in heat regularly and thus in delayed breeding. If the animal does become bred, death of the fetus and an abortion may occur. Any young which are born

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alive are likely to be weak. It has been clearly shown that a lack of the vitamin will cause these troubles in cows which are negative to the blood test for infectious abortion. The first result of a deficiency of vitamin A in the ration of the lactating animal is a lower content of the vitamin in the milk. If the deficiency is severe and prolonged, the health of the animal suffers and her milk yield drops.

The stockman may not be able to recognize definitely that his animals are suffering from a lack of vitamin A from their appearance or behavior alone. But he can judge whether or not they are getting enough of the vitamin by considering the nature of his ration. The principal source of the factor is the leafy green roughages. It actually occurs in the form of carotene, a pigment which is converted into the vitamin in the body. Green growing grass is very rich in carotene, but dried-up grass contains little or none. The legume hays which have been cured so as to preserve their leaves and green color are also rich, and early cut, properly cured timothy is a fair source. Silage is also a substantial source of vitamin A, and silages made by molasses or acid addition are richer than those made in the ordinary way. With the exception of yellow corn, the common grains and their by-products contain little or none of the vitamin.

Cattle and sheep which are on good pasture or are receiving green leafy roughage never suffer from a lack of the vitamin. Depending on its age, the growing dairy calf will receive ample vitamin A from a daily feeding of 0.5 to 2 pounds of bright green legume hay. When the hog's ration consists principally of yellow corn, its needs for vitamin A are probably taken care of adequately, but this is not true where other concentrates are used. The inclusion of 5 per cent of green leafy alfalfa in the winter ration of hogs is the simplest way of making sure that the vitamin A needs are met. Of course, the factor is supplied in abundance by leafy forage crops.

Vitamin D aids in the assimilation of the bone forming minerals, calcium and phosphorus, and thus prevents rickets. The vitamin is essential for this purpose in the rations of growing calves, lambs, foals, and pigs. In severe rickets, the leg bones become crooked and sometimes break. An earlier and less severe symptom in calves is a tendency to stand with the back humped. The hocks are frequently swollen. It should be remembered that the vitamin is only one of the factors involved in normal bone development, for rickets can result from a lack of one of the minerals just as well

as from a lack of the factor aiding their assimilation.

It is readily understood that vitamin D plays a more evident role during growth than later when bone formation has been completed. During milk secretion, however, an active assimilation of calcium and phosphorus is required because of the large amounts of these minerals which go into the milk. Thus when high producing cows are fed for a long time on rations very low in vitamin D, serious results may occur.

Animals which are out in the sunlight never suffer from a lack of vitamin D because the factor is formed in the body when the sunlight shines on the skin. Sunlight through window glass is ineffective. Thus a practical problem arises only when animals are housed inside, and thus generally in winter. Letting the animals outside on good days during the winter months may not suffice because of the number of cloudy days and the lower effectiveness of light at this time of year. The only common feeds which are rich in vitamin D are the sun-cured leafy roughages. The factor is formed in the hay during the curing process under the action of the sun by the same process which causes its formation in the skin exposed to sunlight. Late cut, stemmy hay, lacking in leaves and color, will contain little or none of the vitamin whether it is legume or non-legume.

An adequate amount of vitamin D is very important in the ration of calves. Milk, whole or skim, will not take care of their needs, but sun-cured hay will do it if liberally fed. The calves should have the best quality of hay in the barn. If even this is poor, they should receive a cod liver oil concentrate or some other special supplement containing the vitamin. The needs of hogs not out in the sunlight can be met by including 5 per cent of chopped, sun-cured alfalfa in their ration.

Vitamin E is a factor which has been found essential for reproduction in the rat and chick. There is no convincing evidence at the present time that attention need be given to this vitamin in selecting rations for farm animals. If they actually require it, they should generally receive an ample supply from their usual rations, for various grains and their by-products are good sources and so are pasture grass and leafy roughage.

There are several other vitamins which have been found necessary for rats and chicks but there is no evidence at present which warrants giving attention to them in feeding farm animals. This is also true for certain fatty acids found essential for rats which have been improperly called "vitamin F."

# Trichomonad Disease

Condensed from Guernsey Breeders' Journal

*Drs. Wesley O. Keefer and C. H. Case*

Akron Veterinary Hospital

TRICHOMONAD disease, or trichomoniasis, in cattle is a venereal disease which usually results in abortions during the first few months of pregnancy, pus in the genital organs, or sterility. It is caused by a protozoan parasite which can be seen only under the microscope.

This disease is undoubtedly of great economic importance in this country. No one knows how widespread it is yet, because even the herd owners themselves are not always aware of its presence. Because it was spread far and wide before it was recognized, trichomonad disease is probably second only to Bang's Disease as a cause of abortions and sterility in cattle.

Usually, the first thing that causes the herd owner to suspect something wrong is one or more abortions after two to five months of pregnancy. This may occur in herds that are free from Bang's Disease as readily as in any herd. Some cows will discharge a lot of pus a few days after being bred to an infected bull. Others may apparently conceive all right, and may even be diagnosed pregnant later on; then instead of preparing to freshen when they should, nothing happens. An examination reveals a uterus full of pus. Occasionally, a decomposed calf can be found in this pus.

So far, there is no cure for trichomonad disease. Sexual rest seems to give no results. Trichomonads are easily killed by some of the antiseptic solutions used for douching the sheath of the bull and the genital tract of the cow, but the great difficulty with this method of treatment seems to be that many of these parasites are harbored in the glands and folds of the mucous membrane where the antiseptics cannot reach them. If a cow is badly infected with trichomonads, her reproductive system should be restored to normal by removing all the pus from her uterus, followed by douches of the uterus and vagina with solutions containing an antiseptic which will kill trichomonads. Her ovaries may contain persistent yellow bodies or cysts which should be removed.

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As soon as she comes in heat normally two or three times, she can be bred. Concerning the infected bull—his sheath should be washed out with two or three quarts of a douche containing a suitable antiseptic before and after each service. This will not cure the bull of this disease, but it does help to suppress the trichomonads and reduces the chances for infecting the cow to which he is bred. We know of several bulls treated this way for two or three years that still show trichomonads occasionally.

By far the biggest factor in combating this disease is the difficulty of finding which animals are not infected. If there was a method whereby one could test the whole herd as in Bang's Disease, and be able to divide the herd into negative, positive, and suspicious animals—the whole problem would be simplified. As it is, only the animals showing trichomonads can be called positive. Virgin heifers are practically always negative. Under no circumstances should any suspicious animal be definitely classed as negative to trichomonad disease upon the results of a single examination.

The herd owner who suspects or knows that he has this disease in his cattle should first attempt to find which of his animals are infected. This is especially important in bulls. Many old bulls, including some of the best proved sires, may be badly infected.

A few years ago one of our clients purchased a valuable proved sire. By the time they suspected anything was wrong with him, he had bred twenty-three cows in the herd. Within a year, most of these cows had either aborted or their uteri had filled with pus—causing a loss of $10,000 to these owners. This loss could have been prevented if the bull had been thoroughly checked before using him in the herd. Any bull that has had previous service in another herd should be thoroughly tested. Then, before the bull is used in the herd, and this applies especially to aged bulls, he should breed two or three virgin heifers; then swabs should be taken from the vaginas of these heifers twelve to twenty days after they are bred. The results of the examinations of these swabs gives the best check there is on a bull.

Swabs are also taken from cows to be examined for trichomonads. These swabs from the vagina are useful only when a cow is about to abort and is discharging pus. If there is a mucous plug in the neck of the uterus (denoting pregnancy), swabs will not show any trichomonads. The best way to find out if a cow is infected is to scrape some of the saliva from the back of the

tongue and cheeks of her calf as soon as it is born, or at least before it takes any milk. This is done with a clean spoon. The saliva is put in a sterile vial, an equal amount of normal salt solution is added, and it is taken or mailed to a laboratory that can identify trichomonads. There is no better check for trichomonads in the dam than this, and by the time every cow in the herd freshens, the full extent of this disease in that herd can be determined. This also serves as an additional check on the bull if a record of the breedings to different bulls is kept during that time.

Control consists of knowing which cows do not have trichomonads and breeding these and the virgin heifers to a negative bull. Infected cows should be bred only to a positive bull, because after they are once infected it seems that they develop quite a resistance to the disease and suffer no ill effects. We regularly check cows that have been infected for three years that breed and freshen perfectly normally; yet they are bred to infected bulls and we find trichomonads in the scrapings from the Calf's mouth each year. Many infected cows show no breeding trouble of any kind. Every month we examine several dozen samples for trichomonads, and many of these that are positive are from cows that breed regularly and conceive on the first service. But if these cows are bred to a negative bull, he may become infected and, in turn, infect the rest of the herd. If there are not enough infected cows in the herd to make it worth keeping the positive bull for them, they can be bred to the negative bull by artificial insemination. If the sperm is collected from the bull properly, there is no danger of infecting him. It is very rare that this disease is spread in any way other than breeding, so it is not necesary to separate the infected cows from the negative ones.

If what is known today is applied to testing out new bulls before using them in a herd, a breeder can be spared these losses. The owner of any herd that is badly infected with trichomonads can tell so much regarding the losses from this disease, that it behooves every breeder to take ample precaution.

# Louisiana's Vetiver King

**Condensed from Farm and Ranch**

*B. V. Atwood*

DOWN in deep Dixie a small planter occupies the unique position of being one of this country's outstanding monopolists because his commercial planting of vetiver, a perfumery plant of rare and lasting fragrance, is the only American project of its kind. The story of W. L. Jennings is especially remarkable because he searched the archives of agriculture seeking some unknown crop which he could grow without competition. A former newspaperman, this southerner capitalized on his "nose for news" in spying out a specialized product of high market value.

Jennings' quest eventually unearthed the possibilities in vetiver production far south of snowballs. Not only did he have to develop a market for the dried aromatic roots of the East Indian species which he chose to grow, but he had to experiment and perfect cultural methods and harvesting machinery in preparing his strange product for sale. Blazing the trail for a new industry without antecedents, precedents or traditions takes time; Mr. Jennings devoted several years to tests and research in the establishment of his interesting business. Neither the United States Department of Agriculture nor the State farming experts in Louisiana were able to assist Jennings; they knew nothing about the bizarre crop.

Vetiver is a perennial of the grass family; it was introduced from the East Indies to the Gulf States prior to the Civil War as an ornamental for plantations and because of its aromatic roots. These were saved, washed, and dried by the wealthy plantation owners to be stored with linens, lingerie, silks, satins, and other feminine finery and household goods on account of the attractive and enduring fragrance which they imparted to such articles. An oil was also distilled from the roots by homespun methods and after dilution in alcohol constituted one of the favorite antebellum perfumes.

It was only after much browsing through the musty and somewhat misty bibliography of the old South that Mr. Jennings unearthed a sketchy history of vetiver. Some of his information came from aged planation owners and from negroes who had served them as devoted slaves. Finally he began to experiment with the

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perfumery plants. His foundation stock consisted of but five plants. That small beginning has now expanded into a plantation of close to 50,000 plants which this year will yield approximately $5,000 from 7 acres as well as a wealth of propagating material for next year's planting. New York importers who are having trouble securing dependable supplies of cured roots for perfumery manufacture have contracted with Jennings, who lives in Tangipahoa parish, Louisiana, for the future delivery of several carloads annually. That means that his tiny original business is on the way up to greater profit and permanency. A leading farm machinery manufacturer is co-operating with this Louisianan in efforts to perfect a new type of tractor plow which will dig the vetiver plants when mature without injuring the valuable roots.

The stalks and leaves of vetiver, or Khus khus as the perfumery plant is sometimes called, resemble both broom straw and cat o'nine tails; they grow 6 to 7 feet high and their tassels shaped like those of corn are lavender in tint and attractive for landscaping. Harvesting and planting are simultaneous operations at Jennings' Pine Lawn Farm. The plants are ready for digging immediately after the first hard frost in November; the average plant clump is approximately 12 inches in diameter and yields from one-fourth to one-half pound of dried roots. The individual plant is topped by severing the stalks just above the root crown. After the dirt is removed from the roots the plants are transferred to the cleaning shed where an automobile-washing machine sprays the root clumps with water at 300 pounds pressure. The root masses are cut from the clumps; the roots are immediately spread in wire trays and allowed to dry for twelve hours in the bright sunshine and warm air. The root clumps are then split into as many divisions as possible, hauled to the field, and planted in cultivated rows. Neither insect pests nor fungi attack this crop; the species is very resistant to drouth; in fact during dry weather root growth increases at the expenses of vegetative development.

The grower has experimented this year with one large patch of vetiver which he has cultivated for two years without harvesting any roots. The root yield promises to be measurably larger and the aroma more intense as a result of carrying the vetiver crop over the second season. Next year Mr. Jennings plans pruning tests at regular intervals to determine if mechancial clipping will intensify root production. One explanation of the increased root output during a dry season is the

recently discovered tendency of plants to augment root growth in order to penetrate to the more moist sections of soils.

After the perfumery-plant roots are cured thoroughly they are wrapped in cellophane for the sachet and perfumery trade as well as in compounding various medicinal products. Mr. Jennings has devised an automatic roller somewhat like the machine used in tobacco factories in rolling cigarettes for packaging the vetiver roots. The size of the package is regulated by the length of the belt in the roller machine; kraft paper is used as wrapping material. The ends of each package are sealed with special cement to prevent the roots from absorbing moisture from the air.

Sam, a colored helper employed during the last harvest on America's only vetiver farm, gave the perfumery plant a new nickname. During the digging the youth worked well, listened attentively to the general conversation about the unique crop but personally had little to say. However, when paid off Sam broke his silence and said, "Well, Mister Bossman, Captain, I's cut plenty of corn an' I'se chopped muh share o' cotton, but dis shure am the fust time I'se pulled any teddy bear."

How does the sole vetiver grower market his curiosity crop which looks like hay yet no animal will eat it; which resembles broom corn yet is useless for making brooms; which seemingly would make good fertilizer but which actually possesses little fertility value? A species which yields no human food, whose fiber cannot be woven into clothing, yet one which scents the entire plantation where it grows with a pleasant fragrant perfume. The tops of this strange crop have been analyzed chemically at Louisiana State University and found unsuitable for either rayon or cellulose manufacture.

Vetiver is its own best salesman. Jennings' first customer was the largest department store in New Orleans. It purchased the aromatic roots to conceal among its costly stocks of linens, silks, tapestries, clothing, and lingerie. Hotel managers learned about the new commercial plant from the department store, obtained samples, and became permanent customers. The fame of the perfumery plant soon spread throughout Dixie.

Vial perfume production will be facilitated when the vetiver crop expands to a point where it can adequately provide raw material for that industry. On the basis of the present foreign market, vetiver oil for perfumery has a value of from $12.75 to $14 a pound.

# The Fertile Egg Aids Science

**Condensed from American Poultry Journal**

*Dr. C. D. Carpenter*

LOUIS PASTEUR, the famous French scientist, laid the foundation for the investigation of the diseases of domestic animals when he peered through a crude microscope more than 60 years ago and announced to a skeptical world that the tiny, wriggling bodies he saw there were the cause of disease. Up to that time, everyone else thought that disease occurred spontaneously, and many elaborate explanations were advanced to support these universal beliefs.

Pasteur's earliest animal investigations centered around sheep and chickens; anthrax in the former, cholera in the latter. In both of these cases, he found the actual causative agent in the blood of affected or dead animals.

In the United States, with the founding of Land Grant Colleges and the U. S. Department of Agriculture, the diseases of horses took first place in the minds of research workers in veterinary medicine. This priority is very logical, when we reflect that before the turn of the century, the horse and mule were economically of greatest importance.

As horse diseases yielded to exacting research, and with the coming of motor transportation, scientists turned to the diseases of cows, sheep, hogs and poultry. The protection of the health of the horse by this time, was sufficiently understood so that the average farm work horse, as well as the thoroughbred, had a normal life expectancy of 10 to 15 years.

Now, a new menace invades the equine horizon and threatens the serenity of horse culture. A virulent fatal disease which attacks the brain, has swept the country from east to west, taking a heavy toll, and costing the farmers millions of dollars.

When scientists could not find a causative germ in any part of the affected horses, they turned their attention to the possibility of the cause being a virus. Their efforts were rewarded by the disclosure that, when fresh, diseased brain tissues were finely ground and forced through membranes fine enough to filter out germs, the resulting filtrate (that which went through the filter) would still produce the disease. Thus the name "filtrable virus" is applied to this type of disease agent, to distinguish it from germs, the same as we refer to

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fowl pox, laryngotracheitis, and chick bronchitis as filtrable viruses.

Having found the cause of the disease, scientists then turned their attention to means of treatment and prevention. Since many virus diseases yield to vaccination, they were hopeful of success in this field. Nor were they to be disappointed, but viruses are hard to grow in required quantities, except on or in animals themselves, and sometimes the resulting virus or vaccine is not suitable as an immunizing agent.

As early as 1911, investigators Rous and Murphy found that part of the membranes surrounding the developing chick embryo made a favorable culture medium for the growth of filtrable viruses, but this fact lay dormant until 1931 when Goodpasture revived its use. Then in 1934, Higbie and Howitt, working with the western strain of encephalitis in California, successfully grew this virus on chick embryo, and rapid advances followed, until today the egg ranks at the top as a means of producing vaccines and viruses for man and animal.

As is most obvious, only fertile eggs can be used for this precise work. The procedure and technique are as exacting as they are interesting. Fertile chicken eggs are allowed to incubate normally for about 10 days. Those that show strong normal embryos are selected and a small circular saw revolving at high speed is used to remove the blunt, or air cell end. Since the outer shell membrane adheres closely to the shell it is removed by the same operation, leaving exposed the inner shell membrane which is next to the jelly-like covering of the chick embryo itself.

A small quantity of the pure virus recovered from an affected horse is injected with a small dental syringe through the remaining inner shell membrane onto the chorio-allantoic membrane or envelope that surrounds the developing chick. After this operation, the openings are sealed with cellophane and the eggs returned to the incubator, where they continue incubating for 2 to 4 days. Then they are taken out, and this richly infected tissue is removed, processed by drying under vacuum, and stored for use in powder form.

This kind of a virus vaccine has a distinct advantage over the average animal tissue product, in that the potency is many times greater and permits better standardization. Encephalitis vaccine made from chicken embryos is said to be a thousand times stronger than brain tissue vaccine. Another important fact is that the egg method permits the production of viruses such as these in a sterile medium; one

free from other bacterial agents.

In 1935, Brandly first demonstrated that laryngotracheitis virus could be propagated on chick embryos in a manner which likewise removed the chance of introducing other disease organisms into the vaccine.

Further, Brandly found he could develop both fowl pox and pigeon pox viruses by employing this same technique, and already the poultry and turkey industries are benefiting from these researches.

Already several laboratories are using large numbers of eggs for this work, and no doubt hundreds of thousands will soon be needed. Hatcheries and hatching egg producers should be careful to maintain top quality and high fertility when furnishing eggs for this new field.

It is probable that additional research will find further uses for fertile eggs. Encephalitis is a serious disease in the silver fox industry, and recently Van Roekel reported epidemic tremors in chicks to be an encephalitis.

It is of more than passing interest to note that in certain cancer studies chick embroyos are being used by investigators in this human scourage. Thus the hen takes her place in the scientific world in a comparatively new role that means much to the poultry industry and more to mankind in general.

# Birdsfoot Trefoil

Condensed from Soil Conservation

*R. E. Culbertson*

Manager, Soil Conservation Service Grass Nursery, Ithaca, N. Y.

BIRDSFOOT trefoil as a stabilizer of gullies and road banks, and for summer pasture during periods of drought, has received a great deal of attention in New York State. It appears to have unusual potentialities for the control of soil erosion.

Birdsfoot trefoil (Lotus corniculatus) is a perennial legume which may live indefinitely under favorable conditions. It has a typical taproot with strong growing laterals. There are at least two kinds of plants. These have been designated as hay and pasture types. The former is upright and branched with wide leaves, while the latter is procumbent with narrow leaves. All the overground branches start from the uppermost part of the taproot or crown. Although stems have been found rooting at the nodes, this condition is not common in the field. In the procumbent type, a very heavy mat is produced, with one plant frequently attaining a spread of 6 feet.

The home of birdsfoot trefoil is in temperate Europe and Asia. It has been known in Greece from time immemorial but received little attention either in Europe or America, as an agricultural crop, until a short time before the World War.

The plant has become naturalized in several parts of the United States, notably western Oregon, and eastern New York where it is hardy and persistent and is considered valuable for both hay and pasture.

The plant grows well on a wide range of soils, especially those low in lime and phosphorus and subject to periods of drought. In eastern New York, birdsfoot trefoil is growing luxuriantly on soil having a pH of 4.5 to 5, in association with goldenrod, wild carrot, devil's paintbrush, redtop, poverty grass, and Canada bluegrass.

Botanical analyses made in fields belonging to one of our co-operators, L. H. Cooke, of Preston Hollow, N. Y., showed the following results:

**Site A: Swampy Area**

| | Percent |
|---|---|
| Birdsfoot trefoil | 10 |
| Timothy | 30 |
| Sedge | 20 |
| Rush | 10 |
| Quackgrass | 10 |
| Clover | 10 |
| Weeds | 10 |

**Site B: Abandoned Field, Dry Situation**

| | Percent |
|---|---|
| Birdsfoot Trefoil | 20 |
| Goldenrod | 20 |
| Wild carrot | 10 |
| Redtop | 10 |
| Canada bluegrass | 10 |
| Poverty grass | 15 |
| Other weeds | 5 |
| Bare ground | 10 |

**Site C: Well Cared For Pasture, Intermediate Fertility**

| | Percent |
|---|---|
| Birdsfoot trefoil | 50 |
| Timothy | 10 |
| Canada bluegrass | 10 |
| Redtop | 7 |
| Weeds | 20 |
| Bare ground | 3 |

**Site D: Well Cared For Pasture, Low Fertility**

| | Percent |
|---|---|
| Birdsfoot trefoil | 30 |
| Poverty grass | 30 |
| Canada bluegrass | 10 |
| Wild white clover | 10 |
| Redtop | 5 |
| Timothy | 3 |
| Weeds | 7 |
| Bare ground | 5 |

The plant, likewise, does well on highly fertile soil. It is growing profusely in the soil conservation grass nursery at Ithaca, N. Y., where the soil has a pH of 8.5.

The feeding value of birdsfoot trefoil was recognized by the early Grecians who described it as a leguminous plant on which horses fed. It is highly nutritious and approaches alfalfa as a feed for dairy cows. It is relished by all classes of livestock and is reported not to cause bloating.

In addition to the advantages of birdsfoot trefoil as a good soil binder and gully stabilizer, it has other advantages from the standpoint of practical agronomy. They are listed as follows:

1. It will thrive on soils of low fertility and low pH.
2. It is very drought-resistant.
3. It ranks with redtop and alsike in adaptability to wet soils, and makes good growth in areas unsuited to red clover and alfalfa.
4. It produces 2 to 3 cuttings a year and yields from 1 to 2½ tons of hay per acre.
5. It grows vigorously after cutting and provides excellent aftermath.
6. It is a good soil builder.
7. It makes rank growth during dry hot summers and provides abundant forage during July and August. At Cornell, during July and August a plot of Kentucky bluegrass with birdsfoot trefoil produced nearly four times as much dry weight as a plot of Kentucky bluegrass with white clover.
8. It grows late in the fall and remains green throughout the winter.

9. Animals do not like the flowers; hence, reseeding takes place naturally under pasturing conditions.
10. Hay with ripe pods may be fed to livestock and the seed spread over the pastures in the manure. Passage of the seed through the alimentary canal does not seem to affect the viability.

For successful stands of birdsfoot trefoil, inoculation is absolutely essential. The inoculant is a bacteria *Rhizobium* sp. of the Lotus group. This inoculant may also be used for kidney vetch and the winged pea.

In the latitude of Ithaca, the seed may be broadcast on the grain crop in the early spring or sown alone or in combination during April, May, or August. Fall seeding permits early spring growth and is a means of increasing the amount of pasture or hay for the first season.

For best results birdsfoot trefoil should be planted shallow, never deeper than one-half inch on clay soils and three-fourths inch on sandy soils. The amount to plant per acre will vary with the percent germination and the proportion of hard seeds which sometimes is as high as 75 per cent. One pound of seed to the acre is equivalent to nine seeds per square foot. The usual rate of seeding is 1 to 4 pounds to the acre.

Until more information is gathered relative to this plant's behavior with the grasses in common usage, it appears advisable that the seed be used somewhat sparingly in seeding mixtures—in about the same proportions as white clover.

Under good growing conditions, plants from spring seeding will furnish a fair crop of hay in the early fall. Plants from fall seeding will furnish a larger amount of hay. The matter of haymaking involves no special equipment other than that usually found on the farm. Pure stands of the hay are feasible but pasture type should be sown with ryegrass, bromegrass, orchard grass, timothy, etc.

There is little difficulty in harvesting the hay type of birdsfoot trefoil. In the case of the pasture type the stems are flexible and hug the ground and it is the general custom to sow with a grass such as ryegrass to induce upright growth. When grown primarily for seed, a seeding rate of 2 to 4 pounds of birdsfoot trefoil and 15 to 20 pounds of ryegrass is recommended.

The plant continues to flower and ripen seed simultaneously, so that judgment must be used in harvesting in order that the greatest possible amount of seed be obtained. The best practice is to use the second cutting for seed.

Owing to the rapid dehiscence

of the seed pods if dried in sunlight, they should be cut while still a little green. The best time of day for mowing is while there is some dew on the foliage, and this same rule applies in raking and loading. Good ventilation should be provided when drying in the hayloft.

The seed may be threshed with a regular clover huller equipped with the proper-sized screens. These are one-fifteenth of an inch for the upper and one twenty-second of an inch for the lower. Under average conditions the yield of seed per acre ranges from 100 to 200 pounds. A good seed crop will run about 100 pounds to the ton of hay.

Birdsfoot trefoil is subject to several minor diseases such as leaf spot and powdery and downy mildew, but these diseases seldom cause much damage.

The clover seed chalcis fly (*Burchophagus funebris*) is the important insect pest. This is a small wasp-like insect, the larvae of which eat out the center of the seed leaving a round hole through which the adult emerges. Damage in the field may be reduced by pasturing or making hay of the first crop and saving the second crop for seed.

Newly harvested seed should be examined frequently and in case flies are present they may be killed with carbon disulfide. Satisfactory results may likewise be secured through the use of paradichlorobenzene.

Birdsfoot trefoil is giving good results in the soil erosion program of the Northeastern States, but additional information concerning the adaptation of this plant must be secured before it can be widely used.

# Overloading Electric Wires

*W. C. Krueger*

Electric wires are frequently overloaded by the subsequent addition of equipment not originally planned for. This results in loss of voltage and energy, poor operations of motors and heating apparatus and is a fire hazard.

A very common mistake when wiring buildings is to install wires too small to permit additional loads. It is cheaper and safer to plan for future possibilities and install entrance switches, services and distribution lines heavy enough to carry any reasonable expansion in use. Any power company engineer or local electrician will give advice regarding the necessary size wire for a particular load and distance of run. —*N. J. Farm and Garden*

# Grass Farming System

Condensed from Capper's Farmer

*C. B. Bender*

New Jersey Agricultural Experiment Station

ROTATION of crops has been the practice of Northeastern dairymen for generations. It has not benefited most farms located on hillsides and rolling land. The idea that land is not worked unless it is scouring the plow share still is quite a fixed opinion. Some tenants admit they have worn out two farms and now are on the third. Open land on a slope and our washing rains, have ruined many farms.

It is not my idea to preach on soil conservation because all forces of the Federal and State agricultural agencies are doing that. Futhermore, all the preaching in the world will not change a practice unless a better one is offered in its place.

Eastern dairymen know the value of corn silage in a dairy ration. They also know that hay alone as a roughage will not produce the volume of milk they demand. Some of these dairymen will follow strip farming and contour farming to cut down erosion, but they will be in the minority. The remainder will use the old tried methods until the land will not support the enterprise, that is, unless a substitute for corn silage is found which will be as good as a feed, as cheap to produce, and is not an annual.

Since methods have been developed which will preserve grasses, cereals and legumes as silage with little loss in nutrients, we no longer need worry about a substitute for corn. The method which is most simple and most readily adaptable to the dairy farm is the molasses silage process. The green crop is mowed, brought to the silo while it is high in moisture and chopped. While the material is going through the throat of the chopper, molasses flows on it by gravity at rates dependent on the crop to be ensiled. With grasses and cereals, 40 pounds of molasses a ton of green material is sufficient; 60 pounds for grasses and legumes, 80 pounds for legumes such as clover and alfalfa, and 100 pounds a ton of green soybeans. The material should be leveled and tramped in the silo while filling. When sealing the silo, tramp

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the material thoroughly, cover with tar paper and blow wet waste material on top of the paper to a depth of 1 foot.

With this method, grassland farming becomes a reality.

Molasses grass or legume silage can replace corn silage in the dairy rations to advantage. Timothy silage made from timothy cut in the pre-bloom stage will average 2.7 per cent protein and 18.8 in total digestible nutrients. Alfalfa molasses silage will analyze 4.2 per cent protein and 14.7 per cent total digestible nutrients. Corn silage averages 2.3 per cent protein and 18.7 per cent total digestible nutrients.

Taking yield figures from our Northern Branch of the Experiment Station at Sussex, with these three crops we find:

| | | Nutrients Per Acre | | |
|---|---|---|---|---|
| | | Tons | Protein | Total Digestible Nutrients |
| Corn Silage | 1935 | 14.0 | 640.0 | 5236.0 |
| Corn Silage | 1936 | 12.0 | 552.0 | 4488.0 |
| Timothy, no (N) | 1935 | 7.7 | 415.8 | 2895.2 |
| Timothy (N)* | 1935 | 13.1 | 707.4 | 4925.6 |
| Timothy, no (N) | 1936 | 4.5 | 243.0 | 1692.0 |
| Timothy (N) | 1936 | 9.0 | 486.0 | 3384.0 |
| Alfalfa* | 1935 | 10.0 | 820.0 | 2940.0 |
| Alfalfa* | 1936 | 14.0 | 1148.0 | 4116.0 |

This is not a fair comparison from the standpoint of yields because the corn was grown on our best land and the timothy yields were produced on a shale hillside on a sod that was six years old in 1935.

From the standpoint of cost, figuring all charges in 1936, timothy silage cost $4.62 a ton while corn cost $7.04 a ton. One pound of corn silage nutrients cost $0.18 while one pound of timothy nutrients from the nitrogen treated area cost $.0122.

On 41.5 acres of permanent pasture land on the Wyker farm, 219.9 pounds of total digestible nutrients were produced an acre at a cost of $4.05 an acre or at a nutrient cost of $.018 a pound of nutrients.

Here are the records of a farm in Monmouth county, New Jersey, operating on a full grassland program. Sixty acres are used for permanent pasture for the milking herd. Twenty-seven additional acres of permanent pasture were used by heifers and dry cows. Later in the season they had access to second growth timothy. Two hundred acres were in alfalfa, timothy and clover, timothy and a new seeding in oats.

Four 14 by 30 foot silos were filled with legumes or legumes and grass that received 100 pounds of molasses a ton of green

material; one 14 by 30 foot silo was filled with oat silage and refilled with third cutting alfalfa.

Alfalfa fields received 400 pounds of superphosphate an acre; timothy fields received 200 pounds of cyanamid and 250 pounds of superphosphate an acre. Manure was applied on the hayland.

There are 225 Guernseys on the farm, 116 of them in milk. The farm produced all the silage and all the hay needed for the herds. In addition, 40 tons of hay were sold and the money used for the purchase of bedding. There was sufficient well-fertilized pasture for the milking herd until the last of August when it was supplemented with oat silage until October.

The best alfalfa fields produced a green weight tonnage equivalent to 20 tons an acre.

According to the statement of the manager, this was the first year that enough roughage was produced for the herd. The cows are milking better on the feed, are in better condition and the color and flavor of the milk was much improved over any previous year.

We always like to think of 15 to 20 ton yields of corn to the acre, yet the state average will not be over 7 tons. This same area planted to alfalfa or a mixture of alfalfa and clover will average at least as well as corn and the farm will be covered with soil-improving or conserving crops, surplus hay may be sold to purchase bedding. Another alternative is to grow just enough corn to furnish stalks for bedding which will at least reduce the soil depleting crop acreage by almost two-thirds.

A grassland program which includes common sense fertilization will show a greater net profit and improve the land for the dairyman because:

1. It is a soil building program.
2. It will produce a unit of feed cheaper.
3. It will reduce the cost of grain concentrates because lower protein concentrates may be fed.
4. It should keep the herd in better health.

# Chloropicrin Soil Fumigation

Condensed from Seed World

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*and*
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IN a previous article a few of the results of our research on the possibilities of chemical soil fumigation in increasing yields of field and vegetable crops and controlling weeds, were presented. These results showing increases in productivity of 20 per cent to over 200 per cent for the ten trial crops aroused so much interest and brought so many requests for additional information as to methods of application and conditions where soil fumigation is practical that this second article has been prepared.

As we know, soils are literally alive with micro-organisms, which by their activities keep our soils fertile. While the great majority are not competitive with crop plants, some do compete with them for plant food. Still others present cause disease and injury to roots of growing plants. Growing the same crop, or even similar crops, in the same soil for a few years generally tends to increase certain types of micro-organisms, which soon become so abundant that the crop plant cannot compete successfully with them. In order to aid the plant by eliminating harmful organisms, various methods of partial soil sterilization by means of chemicals have been tested during the past three years at the Rhode Island agricultural experiment station. Of chemicals tried, the injection of undiluted chloropicrin into the soil seems, at present, to have distinct advantages under many conditions.

Soil fumigation with chloropicrin, when properly done, has consistently increased production both in quantity and quality in our experiments. The plants grown in treated soil show greatest improvement in root development, which is reflected in a more vigorous, succulent top growth. This additional root growth is accomplished by the eradication of fungi, insects, nematodes ("eel worms"), protozoa, weed seeds, and certain bacteria from the soil. The beneficial spore-forming bacteria are not destroyed by the

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treatment, and thus the treatment results in a productive growing medium practically free of competitive and plant injurious organisms.

Chloropicrin is one of the so-called "tear gases" that was used in the war. It is a heavy, oily, colorless liquid, which readily vaporizes into a pungent tear gas. Therefore, when the liquid chemical is injected into the soil, it quickly changes to a gas which spreads throughout the soil. Since pure chloropicrin is completely volatile, no residue remains in the soil upon aeration. The chemical is an organic compound containing carbon, chlorine, nitrogen, and oxygen and bears the technical name trichloronitromethane—$CCl_3NO_2$. Because it is non-inflammable there is no danger of explosion or fire in using chloropicrin either in the liquid or gaseous state. Chloropicrin is almost insoluble in water, but it is soluble in alcohol, gasoline, and some other organic solvents.

Three years' experience in the greenhouses of the Rhode Island agricultural experiment station has demonstrated the usefulness of chloropicrin in growing crops. For example, the control of nematodes in heavily infested soils permitted the growth of excellent crops of tomatoes in soils which otherwise would not have supported a crop. For this purpose chloropicrin has shown many advantages over carbon disulphide and compares favorably with steam, without altering the physical condition of the soil. Sweet peas grown in chloropicrin fumigated soil have greatly out-yielded vines grown in formaldehyde treated, carbon disulphide treated, and untreated soils. In the earlier article the resulting increases in yields of field crops and vegetables was shown, and subsequent experiments have verified these. Partial soil sterilization of cold frame and outdoor seedbeds permitting the growth of cabbage, celery, and rhododendron seedlings more free of disease and injuries suggests its trial and use by commercial market gardeners, nurserymen, and florists. The "tear-gas" is also showing promise in the treatment of florists' benches and ground beds in the greenhouse. Another application is the treatment of compost soil to rid it of pests and weed seeds soil, etc. The greenskeeper will also find chloropicrin useful in before use in seed flats, potting the fumigation of turf top-dressing soil. Trials in conjunction with the extensive turf research of this experiment station have shown that under proper conditions of treatment the top-dressing soil can be made practically free from weeds and pests at small cost and labor.

In fumigating soil with chloro-

picrin the following factors should be kept in mind: (a) the gas must penetrate through all parts of the soil to the organisms to be destroyed; (b) a lethal concentration of the "tear-gas" must be kept in contact with these organisms long enough to assure results; and (c) after the pests are killed, the vapor should escape as rapidly as possible.

Therefore, certain general recommendations can be made in chloropicrin soil fumigation regardless of the type of organism against which the fumigation is directed:

1—*Soil temperature.* The effectiveness of chloropicrin increases as the soil temperature rises. At higher temperatures better results can be had with lower dosages. Best results are secured with soil temperatures of 60-65° or higher. Below this results are not quite so good, particularly in the case of weed seed. No treatment should be attempted at less than 45°F.

2—*Moisture content.* A moderate moisture condition is desirable. Excess moisture will cut down diffusion, but some moisture makes the soil organisms more susceptible to the gas. So, if possible, do not treat when soil is very dry or very wet. The desirable point can be determined by compacting some soil in the hand. *If it will just hold its shape,* it is about right.

3—*Soil texture or compactness.* For best results, the soil should be in a good, loose condition, since this will enable the gas to penetrate or diffuse more readily. If too firmly compacted or badly cracked, soil should be plowed or harrowed and rolled for planting before treatment. Ordinarily, a soil worked the previous season will be loose enough. All manure or other organic fertilizer should be added before fumigation.

4—*Spacing and dosage.* Unless otherwise recommended for specific organisms, chloropicrin should be injected about 6 to 8 inches deep and in holes 12 inches apart —that is, 12 inches between rows and holes 12 inches apart in the rows in stagger formation. If desired, especially for the organisms more easily killed, this distance can be increased to 15 inches apart with a saving in labor. In raised benches or in other soil with a depth of less than 12 inches, apply at a depth of two-thirds of the distance between the surface and the bottom. Thus for soil 12 inches deep, chloropicrin should be injected 8 inches below the surface. (See table below.)

5—*Gas retention.* To prevent too rapid escape of chloropicrin from the soil, special precautions must be taken right after application. Immediately after each injection, the hole should be filled and the soil firmed. As each area

is finished, a water seal should be created by sprinkling so as to wet the soil to a depth of about one inch. It is desirable to keep this inch wet for a day or two.

The most efficient method of gas retention is to use a gas impervious cover instead of the water seal. By using a glue-coated kraft paper or a cellophane material, the dosage required can be materially reduced, but in many cases the cost and inconvenience of handling and sealing may be considered prohibitive.

6—*Safe Time to Plant.* Chloropicrin is very toxic to plants. So *do not plant until all traces of gas have left the soil.*

The time required for this will vary from five to fifteen days, depending on the moisture content of the soil and temperature. Low moisture and high temperature will decrease the interval, so that if possible, soil should be in a warm place to assist drying out. Spading or screening soil will help eliminate the gas. Light sandy soils will air out more rapidly than heavy clay soils.

*Control of Weed Seeds*

In the control of weed seeds temperature and moisture must be more accurately controlled than in the case of any other soil organism. Soil temperature should be 60-65° F. *or higher* and the soil medium wet, say about 40-50 per cent of its water-holding capacity. If the soil is dry, give it a wetting about one week before fumigation, to be sure the seeds absorb moisture and thus make them more readily killed by the chloropicrin vapors. In the intervening time the soil will have opportunity to dry to the moisture content desired. The nearer the seeds are to their germination point, the more easily they are killed by the chloropicrin treatment.

The seeds of different plants vary in resistance to killing so that application rates will vary from 2 to 10 cubic centimeters per cubic foot of soil. Where the soil is to be used for seed flats, potting, or turf top-dressing, and a high weed mortality is desired, a dosage of one-half to one pound of chloropicrin per cubic yard of soil should be used.

*Control of Nematodes*

Nematodes are more resistant than most other soil organisms. If possible, at least two weeks should be allowed for the decay of infested root tissues before treatment because of the protection they afford the organisms. The most profitable rate of application will vary greatly, depending on intensity of the infestation and the type of soil. Recommended dosages vary from 2 to 8 cc. injected 12 inches apart. Use the most efficient and practical means of gas retention available, thus

making it possible to take advantage of the lowest effective dosage.

*Treating Compost-Soil Mixtures*

The fumigation of potting or top-dressing soil in tight boxes with chloropicrin is a simple method of effecting partial sterilization. The boxes may be of any convenient size, such as 4 feet by 3 feet by 27 inches deep for a cubic yard, and should be tightly constructed.

When mixing the compost with other materials such as sand or peat, the soil should be screened, then placed in the box for treatment. In applying chloropicrin, the object is to inject the required amount into the center of each cubic foot of soil in the box. Either a special applicator is used (described later) or crowbar holes are made in the soil, starting 6 inches in from the edge of the box. The holes are spaced 12 inches apart and extend to within 6 inches of the bottom. If the box is more than 12 or 14 inches deep, the holes at the first level (6 inches from bottom of box) should be filled in after injection and a second series of holes made at the next appropriate higher level (about 18 inches from box bottom). To be sure of tightness around the lid, it is well to cover the joints with gummed paper tape.

Dosage for most potting soil work is 5 to 6 cc. per cubic foot of soil, with an exposure of three days. At the end of this period the cover is removed and soil left to air out—better yet, dump it out of box. *Extreme care should be taken not to recontaminate this treated soil.* As in other cases, soil should not be used for planting until all trace of chloropicrin has left it.

In cold weather the soil temperature should be maintained at recommended 65° or higher by placing box in a boiler room or other warm place and allowing the soil to warm up. While living plants should not be in the vicinity, the slow gas leakage is not usually troublesome to workmen. Dumping of soil for airing should be carried on where the escaping fumes will not cause discomfort or damage.

A method of treating the compost pile in place is being developed by covering it with a gas impervious cellophane "blanket" but sufficient tests have not been completed as yet for recommendation.

*Application Equipment*

On large areas chloropicrin is readily injected into the soil with a special hand applicator developed for this purpose by Innis, Speiden & Company. One man can treat 1,000 to 1,500 square feet per hour with this applicator —about a quarter of an acre per day. Full instructions for use come with the "Applicator." The

individual unit discharge, which can be varied up to 5 cc. is quite accurate.

After soil has been treated, care must be taken not to recontaminate it. Any substance, such as manure, likely to carry injurious organisms, should be added to the soil *before* treatment, or treated separately.

Also, practical precautions should be taken so as not to reinfest the fumigated soil by placing it on contaminated locations, walking from untreated to treated beds, carrying pest-harbored soil on tools, and planting infected seeds. In choosing areas for treatment, keep in mind the surface drainage factor. Try to treat areas where surface water from higher contaminated ground will not carry injurious organisms onto the treated soil.

*Precautions*

1—Chloropicrin is extremely toxic not only to disease-producing micro-organisms, but to living plants as well. Every precaution should be taken to prevent even low concentrations coming in contact with plants.

2—With the special applicator the chemical can be applied without discomfort to the workers. It must be kept in mind that chloropicrin is a throat and eye irritant, and utmost care should be taken in handling it. However, cholopicrin is not dangerous to work with as no person can willingly remain in more than a small fraction of the concentration dangerous to human life. Avoid exposure to discomforting concentrations. Immediate relief can be obtained by breathing fresh air.

3—The following precautions will help in developing your own technique for handling chloropicrin without inconvenience:

(a) Open the cylinders out of doors and fill applicators in the open air.

(b) When indoors, avoid the use of a funnel whenever practical. Avoid spilling even drops. Inject directly into holes, fill them promptly with soil.

(c) Keep liquid off of the skin. If chloropicrin accidentally comes in contact with the skin, wipe it off promptly in order to avoid later irritation. If spilled on clothes, remove shoe or garment without delay.

Several concerns manufacture and offer chloropicrin for sale at prices ranging from eighty cents to one dollar or more per pound. At this rate it costs from fifty cents to one dollar to treat a cubic yard of compost. Seed bed fumigation would cost from six to fifteen dollars per thousand square feet. An acre of greenhouse or field soil would require from eighty to three hundred and sixty dollars worth of material,

depending on the dosage necessary to kill the pests present, plus a labor charge of about fifteen to twenty dollars for application. The applicator, which is available for injecting chloropicrin, sells for ten dollars.

**Chloropicrin Required for Soil Treatment**

**Approximate Application Rates—**

**Injections 12 inches apart:**

1 cc. per injection—160 lbs. per acre— 3⅔ lbs. per 1,000 sq. ft.
2 cc. per injection—320 lbs. per acre— 7⅓ lbs. per 1,000 sq. ft.
3 cc. per injection—480 lbs. per acre—11 lbs. per 1,000 sq. ft.

**Injections 15 inches apart:**

1 cc. per injection—100 lbs. per acre— 2½ lbs. per 1,000 sq. ft.
2 cc. per injection—200 lbs. per acre— 4⅔ lbs. per 1,000 sq. ft.
3 cc. per injection—300 lbs. per acre— 7 lbs. per 1,000 sq. ft.

**Comparisons of Weights and Measures:**

1 American quart—32 fl. oz.—946 cc.—3½ lbs. of chloropicrin
1 pound of chloropicrin—16 avoir. oz.—9.15 fl. oz.—273 cc.

# Calf-Feeding

Condensed from Successful Farming

IT is expensive to use whole milk as a feed for calves. A dry calf-starter, developed at Cornell University can largely take the place of milk in the calf ration. This is the formula:

| | |
|---|---|
| Ground yellow corn | 32.25 pounds |
| Rolled oats (oatmeal) | 28.00 pounds |
| Wheat bran | 10.00 pounds |
| Linseed meal | 5.00 pounds |
| Whitefish meal | 3.00 pounds |
| Dried skim milk | 20.00 pounds |
| Steamed bone meal | .50 pounds |
| Ground limestone | .50 pounds |
| Salt | .50 pounds |
| Cod-liver oil reinforced for Vitamins A and D | .25 pounds |
| | 100.00 pounds |

The essential features of feeding calves on this starter are as follows:

A total of 350 pounds is allowed per calf. For Holsteins and calves of other large breeds this is given over the first 7 weeks. A schedule which allows 8 pounds per day during the first week, 9 pounds the second week, and 10, 9, 7, 6, and 4 pounds daily during the respective succeeding weeks will just about use 350 pounds of starter per calf. Jerseys and Guernseys are allowed the same total amount of starter

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but they are never given more than 7 pounds daily and are fed milk during the first 10 weeks.

When the calf is 2 weeks old or even earlier, the starter is placed in a conveniently located trough. Dry calf-starter is always kept before the calf, allowing it to eat as much as it will until a level of 4 pounds daily is reached for calves of the larger breeds and 3 pounds for the smaller breeds. The calves are usually about 3 months old by this time. The calves are then limited to these levels and fed twice daily. At 4 months of age the dry calf-starter is discontinued.

Continuing its experiments with the starter, Cornell has recently reported that calves grow much better if a little yeast is added. Yeast has never been looked upon with much favor as a calf feed in the past, and feeding tests have upheld this belief. However, when fed as a supplement to the dry calf-starter, the results are distinctly beneficial. With one group of 13 calves, which received 6.25 percent dried brewer's yeast with the starter mixture, growth was fully ⅓ greater than what is generally considered as normal. In another test, when the amount of dried skim milk in the original formula was reduced to 10 percent, and 16 percent cereal yeast feed (composed of approximately 60 percent corn gluten feed, 20 percent corn germ meal and 20 percent yeast) was added, the average growth of 9 calves on the mixture was 42 percent above normal! With still another group, where the dried skim milk was limited to 10 percent, and 5 percent each of the cereal yeast feed and soybean oil meal added, the average growth of 18 calves was nearly ⅓ greater than normal.

In other words, some 40 calves on yeast-containing rations made an average growth which was fully ⅓ greater than normal, as compared with 12 percent greater than normal growth for calves on the dry calf-starter alone. The gains were also made more economically. Observations made during the experiments indicated that the yeast did not increase or decrease the palatability of the starter mixture, and, in spite of the old story about yeast stimulating the appetite, it was not evident in these tests. It is known that yeast is especially rich in Vitamins B and G, which are vitally concerned in growth and well-being, and it is thought that much of the benefit from the yeast is due to the presence of one or both of these vitamins.

*—W. H. R., Kans.*

# Temporary Silos

Condensed from Michigan Farmer

*C. H. Jefferson*

Agricultural Engineering Section, Michigan State College

THE use of some temporary or semi-permanent silo has become a common practice on many farms. During unfavorable growing seasons when a feed shortage is anticipated a temporary silo makes it possible to conserve roughage that might not otherwise be used. When nature has been more considerate and abundant feed is available a temporary silo makes it possible to conserve surplus feed that might otherwise be wasted. A silo constructed to serve an immediate need has often solved the feed problem on many small farms or on rented farms that have no permanent silo.

The paper lined snow fence silo has been one of the most practical for temporary use. It is constructed of strips of snow fence formed into a circle and placed one above the other. The inside of the fence is lined with a heavy reinforced, waterproof paper.

These materials can usually be obtained from local lumber yards. The picket fence is the type used along highways to keep snow from drifting into the road. The same type of fence is often used for temporary corn cribs. The pickets are 4 feet long, one and one-half inches wide and one-half inch thick, securely wired to make a strong, light weight fence. The fence is available in 50 to 100 foot rolls and costs from 6 to 7 cents a lineal foot.

The most satisfactory paper for lining is composed of two thicknesses of waterproof kraft paper having an interwoven layer of sisal fiber between them and the two bound together with asphalt. The paper is available in rolls of 600 and 1,200 square feet and costs approximately one cent per square foot.

The total cost of materials for a 50 ton silo or one 16 feet in diameter and 16 feet high is approximately $30. It is erected as it is filled and the labor cost is relatively small.

A level site close to the barn or feeding place should be selected for the silo. A low, wide silo is much more desirable than a high, narrow one because the snow fence will not support the weight

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of a high column of silage. Past experience indicates that the most desirable width is from 12 to 16 feet and the height from 16 to 20 feet. A 16 foot silo requires one complete 50 foot roll of fence for each section and where this diameter is used, considerable splicing of wire is eliminated and no fence is wasted. If additional reinforcing wires are used around the outside of the silo, the height may be increased.

Before the fence is used it should be thoroughly stretched by attaching one end to a post and using an ordinary fence stretcher on the other end. If the fence is not stretched before it is used, it will do so as the silage settles, resulting in torn paper and spoiled silage.

The trench silo is simply a ditch dug in the ground usually with the aid of a plow and slip scraper to a depth of 8 to 12 feet. The width at the top is about 12 feet and at the bottom about 8 feet. The sloping walls not only make packing easier and more thorough, but also assist in avoiding air pockets which cause considerable spoilage.

For temporary use the plain earth side walls are carefully smoothed with a spade, but if the silo is to be used year after year, a permanent finish for side walls is more desirable. It may be possible to use a trench silo for one or two years without any lining on the inside walls. If used year after year, however, the silage begins to spoil around the edges due perhaps to bacteria which remain in the soil. The earth walls begin to scale off leaving pockets which must be patched up or smoothed by widening the silo. For this reason the walls are usually lined with some more permanent material. Several materials have been used for this purpose, including plank, poles, brick, stone, plaster, or concrete.

The factors to be considered in locating a trench silo are, surface drainage, type of soil and convenience for feeding. Surface water should drain away from the silo. If it seeps into the silo the walls may cave in and spoil part of the silage. The remaining silage is also harder to remove. Ground water should be kept out of the silo, preferably by natural drainage, but if necessary, a drain can be laid around the sides near the floor. If a permanent floor is laid, it should be provided with a drain. Otherwise, a pump may be necessary to remove any surplus water before the silo is refilled.

The trench silo may be excavated in a light, sandy loam that will hold its shape while the trench is being dug, but light enough to be well drained. A soil free from clay, hardpan or loose rock is desirable.

The most convenient place for

feeding will usually be near the barn. A very practical arrangement in connection with a bank barn can be obtained by building the silo adjacent to the barn and using the outside wall of the barn as one of the walls to the silo.

Another silo which may be more permanent than temporary yet one that is economical to construct is the sheet metal silo. It is constructed of corrugated sheet metal on the inside of wooden hoops. The hoops keep the silo from bulging and the metal gives it stiffness and rigidity.

Each wooden hoop is made of 4 strips of one-half by three-inch lumber. They are assembled in a circular form made by nailing 2 by 4 blocks around a circle 10 feet in diameter. The strips are bent around the outside of these blocks, wedged into place and securely nailed from both sides with 8 penny nails spaced about one foot apart.

As soon as all hoops are completed they are placed upright two feet apart on a level platform and securely braced. While in this position the sheet metal is nailed to the inside of the hoops. The sheet metal should be 26 or 28 gauge corrugated metal coated with two ounces of zinc per square foot. The sheets come in any length from 5 to 12 feet and a 10 or 12 foot length is probably most practical. Three 10 foot lengths would make a silo about 28 feet high and three 12 foot lengths, one about 34 feet high. The most practical height is about 30 feet. Both end and side joints where the sheet metal is lapped should be cemented with a plastic asphalt emulsion to exclude air. In applying the sheet metal a space equal to the width of one sheet minus two side laps of two and one-half corrugations should be left for the door.

As soon as the silo has been assembled it may be raised by using a blocking tackle and gin poles, and placed upon a previously constructed foundation. The final step in erecting the silo is to pour a concrete curb around the bottom to anchor it in place, and put in a concrete floor.

The cost of such a silo 10 feet in diameter and 30 feet high will be approximately $150. It will hold about 50 ton of silage.

# Ki-Yi-Yi-Ki-Yi-Ki-Yoo-oo-oo-o

Condensed from The Washington Farmer

FARMERS and stockmen have been fighting the coyote for half a century in this western country, but he is killing more sheep, chickens, calves and other domestic animals than ever before.

He seems to thrive on persecution. He seems able to adapt himself to the ways of so-called civilization and to increase both in numbers and in cunning.

Man has slain the coyote's babies at denning time. He has trapped him in the winter months for his fur. He has trailed him with hounds and bombarded him with his "field artillery." He has poisoned him with the most deadly of chemical formulas science has been able to devise.

But today this chief of all predators howls defiance to the world.

The last report of the United States biological survey says: "The continued increase of predators, especially coyotes, over wide areas of the western states, has aroused added interest in their control on the part of co-operating organizations. State legislatures in Texas, Oregon, Oklahoma, Colorado and Idaho have substantially increased their appropriations for co-operative work with the bureau."

In California, last year, the coyote catch was the largest during the nearly 20 years the biological survey has been on the job. Yet the California Wool Growers' association reports that complaints of coyote damage are becoming more numerous. In southern Idaho coyotes became so bad around the lambing camps last spring a group of sheepmen hired a crew of airplane hunters to gun for them. Wool growers never meet in convention in Washington, Oregon or Idaho without giving consideration to the problem of coyote control.

Has the coyote become so smart that he is able to outwit his would-be destroyers? The biological survey admits that control work has made many of these animals extremely wary. But is the coyote more cunning than man?

For 36 years, George Petrie, of Montana, has been matching his wits with the coyote. He has begun using airplanes instead of traps, rifle and poison. But Petrie doesn't believe the coyote is a bit smarter now than it was a quarter of a century ago. He has merely fallen in step with civilization and is making the most of his new surroundings.

Best explanation of the coyote's

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tenacity appears to lie in its change of habitat. Traditionally a resident of "the lone prairie," the coyote has met the pressure of civilization by retreating into rougher mountain country. One hears many stories of coyote abundance in high mountain country where 20 or 30 years ago there wasn't even a track.

"There's coyotes on every high ridge in this country," said George Lowe, of Kooskia, Idaho, veteran cougar hunter for the Idaho state game department, as he stood before his home and swept his right arm toward the Clearwater mountain country. "Stockmen who have used those hills tell me that 20 years ago they never saw any there."

Lowe firmly believes that the coyote has become a far more serious menace of wild life, particularly deer, than the cougar ever was. He should be an authority. For 13 winters he has hunted cougar for the Idaho state game department, bagging 158 of the big cats. "I doubt if 10,000 would cover the number of deer I have found killed by coyotes," he said. "Two coyotes will kill a grown deer. Coyotes have taken on killer tactics like the wolf."

The coyote is a prolific breeder, and in a short time can populate a large area. This is the most plausible explanation of today's increasing coyote problem.

Woolman Petrie, of Montana, says that hiring a skilled airplane coyote hunter is the only way to free the ranges. He hired one who averaged 16 coyotes a day, 400 for the entire hunting period. In Oregon last year Ranger Eldon Ball, of the Ochoco national forest, did some airplane hunting. Flying about 50 miles an hour at an altitude of 500 feet he averaged 5 to 6 coyotes each flight. He killed 16 near one band of sheep. Hunting was done mostly in early morning by a couple of Twin Falls aviators. The hunters reported they killed several hundred coyotes. Herders reported they found many dead ones. One coyote was actually killed with a lamb in its possession. Stockmen reported that losses immediately dropped.

Less spectacular but widely adaptable is the den hunting method, which has stood the test of years. "There is perhaps no better way of keeping down the increase of coyotes than to destroy the newly-born whelps before they abandon their dens to shift for themselves," says the biological survey, which last year issued a brief but timely publication (leaflet 132) on den hunting. A little time spent in locating dens in April, May and June and destroying the whelps will save months of strenuous effort trying to rid the range of the predators after they have reached maturity.

# The New Sugar Beet Deal

Condensed from California Cultivator

*V. O. Hansen*

CHALK up another for the government experimental stations. They have solved another farming problem which has proved very practical in the commercial world. The new sugar beet seed has been the one big factor in bringing new life to the nearly dead beet sugar industry of the West.

The agricultural experiment stations have long been of great value to many branches of the farming industry. They might be compared with the laboratories and proving grounds of large factories. The factories carry on continuous experiments to produce a better product. The cost of the experimenting is borne by the factory or organization. The upkeep of the agricultural experiment stations is paid by the government, since no farmer could bear the cost of the many experiments, and since it is vital to the people of the nation to have such agricultural problems solved.

A view of western sugar beet industry a decade back shows that an improved beet was necessary if it was to continue to be a commercial crop. Less acreage was being planted each year and many sugar beet refineries were closed. The outlook, of course, was more dismal each year. The disease called curly top was the cause of the decline in sugar beet planting. Curly top curled and killed the leaves and the beets did not grow large enough or have sufficiently high sugar content to be of practical use in a commercial sense.

Then came the results of the experiments of Dr. E. Carsner, of the United States Department of Agriculture. Dr. Carsner's aim was to develop a sugar beet that would resist the curly top. From 1922 to 1929, first in the employ of one of the sugar companies and then as a faculty member of the California Agricultural College at Davis, Dr. Katherine Esau handled some of the basic work required in developing a resistant beet. The beets of her improved variety were crossed with beets developed by Dr. Carsner, and the new beet proved successful in Montana. These cross-bred beets were again crossed with other varieties by Carsner and the most promising strains were continued in field plats. From his headquarters at Riverside, Dr. Carsner checked

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on the success of growing the several new varieties.

Then began a search for the peculiar soil and climatic conditions where seed could be propagated. Four places were found; Las Cruces, N. M.; St. George, Utah; Phoenix, Ariz.; and in the section around Hemet, Riverside County, where, at present, more curly top resistant seed is raised than in any other locality. The start began with a half-acre plat at Hemet in 1929, and the success warrented planting five acres in 1930 for seed production. This new seed then was distributed to the old sugar beet districts of the western states. It was found that the new seed would produce fourteen to fifteen tons to the acre of quality beets, resistant to curly top, which would reach the factories in good condition and provide good returns for both grower and refiner. Such a beet, naturally, was in demand, and this required added seed production. Since then, not only have the old fields been replanted, but during the last few years many acres in addition have been placed in sugar beet production. It is estimated that 150,000 acres of new fields have been planted in the last five years.

When the new beet seed proved of value, the next step was to place it on a price basis, where returns might be fairly stable, year after year. At Hemet a local seed company contracted to oversee the growing and handle the seed from the growers of that section. Since 1930, most of the farmers have contracted with the seed company, at the time of planting, for the sale of the seed at a specified price. Thus, the seed company controls the quantity of seed, as well as quality. Without a contract, the farmer would have no market for his seed. The seed company, in turn, has a contract with the Western States Sugar Beet Committee, Geo. T. Scott, secretary, of Berkely, where the seed is sold. The Western States Sugar Beet Committee is the contact agent between the sugar factories and the seed growers, or seed company. The sugar factories then resell the seed to the sugar beet growers who supply the raw material for the factories. The beet grower cannot purchase the new seed without signing a contract wherein he agrees to sell the crop to the refinery. Under such a setup, the seed grower and the sugar beet grower each knows in advance the price he will receive for his products. The refineries can estimate the demand for their sugar and know how many acres of beets will be needed to supply their market with the required amount of sugar. Then they contract for seed and the seed committee arranges with the farmers of Hemet and the other seed

growing districts, to raise enough seed to plant the estimated sugar beet acreage. Thus the entire industry is controlled to match the demand for sugar, and with fair returns for all. Perhaps if more farming activities were under a like arrangement those concerned would be more satisfied because of a better stabilization of their market.

# Farm Tenantry Can Be Profitable

Condensed from Nation's Business

*J. Gilbert Hill*

NET increase in assets—$723.90. That is the auditor's report on the business of Mr. and Mrs. Ralph White, Harrah, Okla., farm tenants.

But even more important, the report is a dramatic story in dollars and cents of a hard-headed, practical attack on problems of southern farm tenantry by ordinary business men operating for the simple motive of profit.

The $723.90 represents profit, plus a living, which a young American family earned on an 80-acre, upland farm in just 11 months—thereby becoming far more independent than many who consider themselves more fortunate because they live in cities and spend big salaries.

It is the success story of a young man and his wife, 25 and 21 years old, parents of a young child—whipped a few months before by drouth, low farm prices, and underfinancing—and a group of business men with an idea that the best way to create business is to make it possible for folks to produce profitably.

The accomplishment can be duplicated anywhere. There are no tricks. The Whites are ordinary farm folks, with the same kind of educations, ambitions, initiative, motives, and faults of thousands of young married couples trying to win a start in life.

It costs no additional taxes for subsidies.

It uses agencies already created.

It is about twice as profitable, eventually, for the landlord.

And, it may be the answer to the farm tenant problem which has haunted so many southern states for generations.

But that's getting ahead of the story of a rural electrification development man for a utility company who ran head-on into tenant problem facts. All government statements to the contrary, Roy Hayman found that unprosperous farmers could not buy, or

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use, electric power no matter how cheap. But Hayman's serious study of the tenant problem revealed nothing new.

Landlords had been cussing tenants for years because they were "no account"; wouldn't work; let the soil wash away; allowed fences to fall and used the posts for firewood; even tore down the buildings for the same purpose, and "stole" more than their share of the crops.

Tenants had been cussing landlords because they refused to repair buildings; insisted upon impossible production of cash crops from run-down farms; always accused the tenants of stealing more than their share; and demanded that the tenants move at the end of the year because they didn't operate the farm so that it produced six per cent and taxes.

Hayman, like many another observer, could see that both were right in far too many instances!

But it is an impossible situation. As the countryside deteriorates, purchasing power of both landlords and tenants declines. Weakened purchasing power means that local merchants have less business. As rural buildings fall to ruin more village homes go unpainted. Poor villages mean less business for the cities. Less business in the cities means unemployment—and to a utility man—not only no electricity sold in the country, but less power to villages and cities.

Yet, tenantry isn't an unmitigated evil. Some tenants make money for themselves and landlords on good land. The experts know, too, there always should be a few farms for rent so young couples can use land for a time and save enough for a down payment on a farm of their own.

Members of the Natural Resources Committee of the Oklahoma City Chamber of Commerce agreed with Hayman that tenants could not be blamed for taking no interest in land if they were to move next year. Yet, landlords couldn't be blamed either for trying to worm enough out of investments, if possible, to pay taxes.

But, they also agreed, there ought to be a common sense way out. Long and serious study developed the idea that a landlord should be willing to forego his cash rent for a time and take his profit in increased soil fertility and improvements, in order to encourage a tenant to improve a property. But no one wanted to take the first risk.

It was then that Hayman produced the 80-acre tract now occupied by the Whites. It is owned by the Oklahoma Gas and Electric Co., his employer, and is an unused part of the site of a generating plant. It is typical "corp-

oration farm land" rented to a succession of tenants with no one taking any personal interest.

The house was painted but run down. The yard was overgrown with weeds. Debris littered the barn lots. The well was in bad condition. Fences were down. Fields were eroded. The farm includes both deep sand and clay soil. In one case a five-foot fence was covered with drifting sand. In another field the stiff red clay subsoil, bare of vegetation, was all that remained after the topsoil had eroded away.

The utility company, headed by J. F. Owens, a United States Chamber director, agreed to lease the land to the Oklahoma City Chamber, rent free, as a farm tenant demonstration project.

A committee headed by George Glossop, life insurance company land man, spent weeks seeking the right tenant, one who would be average for the community, but who would do some unusual clerical work.

The Whites had gone broke in the previous year's drouth. Both were high school graduates and both had had some 4-H Club work. They were reared in the neighborhood. They had a baby. They were honest. The Farm Security Administration would finance them. Both had reputations for industry.

On February 2, 1938, Mr. and Mrs. White finally signed a strange lease on the farm. It gave them a five-year contract rent free, provided they made certain definite improvements. But it also provided they should keep farm records such as no one else ever kept before. Purposes of the Glossop committee were:

1. To demonstrate possibility for an average tenant farmer to support himself and his family on an average upland farm in keeping with desirable standards of living.

2. To determine the possibility of profitable operation for the land owner.

3. To determine to what degree soil and physical properties of an average run-down farm may be improved to the mutual benefit of landlord and tenant through an equitable landowner-tenant contract.

4. To demonstrate benefits of long-term contracts between landowner and tenant.

While the lease was for five years it could be broken within 90 days upon payment for growing crops if the utility firm needed the land. This special clause was required to protect the firm if the land was needed for expansion—a clause not required for the ordinary lease.

The lease required that the landlord should be compensated for wilful damages to his property.

It provided that the tenant should provide all necessary livestock and equipment.

It set up a regular crop rent share of production for the landlord, including a fifth of gross income from truck crops; a fourth of the cotton, and a third of all other crops. The tenant was to sell the landlord's share and deposit the money in escrow in the bank. But the money was to be returned to the Whites at the end of the year for definite farm practices increasing the value of the land.

For instance, White agreed to farm on the contour to end washing of soil. He agreed to plant, and turn under, ten acres of legumes each year for fertilizer. He agreed to clear three acres of woodland each year for pasture and keep the underbrush out of the cleared space. He agreed not to sell wood or to cut desirable trees for his own wood without permission of the landlord. He was to be allowed to cut posts and use fences in any manner to suit his convenience.

And, strange to most share crop contracts, it provided that the farmer could use two acres for a garden to produce his own food.

The farming program was outlined by extension specialists from Oklahoma A. and M. College. White was financed by borrowing $240.50 from the Farm Security Administration. Both services are available to any farmer.

While no single year's experience proves an entire program, no one can deny that the auditor's report of the accounts kept under the contract are enough to raise hopes. Summarized these results are:

1. The Whites were $723.90 better off 11 months after they signed their lease, and the auditors did not count in $77.97 paid back to the Government on their loan.

2. The landlord turned back $100.79 in share crop rent under the contract and received therefor work which company land men estimate would have cost $200 with hired labor.

3. Conservative farmers in the neighborhood estimate the value of the $200 in actual work, cleaning up, grassing the blowing sandhill, fertilizing the soil, and clearing the pasture actually has increased sale value of the land $500.

The tenants began the year with assets in tools and livestock of $266. An inventory at the end of the year showed tools, livestock, feed, seed and winter growing crops worth $722.25—a net gain of $456.25.

The tenants' inventory of household goods, furniture, and personal belongings in February was $97.50. At the end of the year there were new furniture,

clothing, a pressure cooker, laundry equipment, stored potatoes, canned fruits and vegetables, which raised that total to $256.80—a net gain of $159.30.

The Whites began the year without money and with a loan of $240.50. They ended with $7.56 cash, $100.79 deposited in the bank as escrow rent which was returned, new farm equipment, feed, food, and household goods, and $77.97 paid on their note.

There are other factors which interest the farmer or farm owner. First, White's record is for a year of about average weather conditions. So it is no fluke. The tenant moved on the farm too late in the year to build terraces. But he did farm on the contour, planted on top of broad, flat ridges for strip crops and cultivated carefully.

He planted Sudan grass on the blowing sandhill, cut a hay crop, and had the roots and a small autumn growth left to hold it against the high winds of winter.

The general farming program consisted of 22.1 acres in general crops, 5.7 acres in cotton, five acres to soil building. He has complied with the Government's cotton crop restriction program, for which, under his contract, he gets the entire bonus. He produced tomatoes, beans, peas, watermelons, corn for feed, corn for feed which he sold for $80.

The meticulous record which the young farmer kept is perhaps the most interesting document of the summer. White reported exactly 2,301½ hours for the 9½ months from February 2 through a half month of November. It even included the chores which took from 27 to 57½ hours a month, 17 per cent of the total. The average is a little more than 53 hours a week, 7½ hours a day for seven days a week.

The feed, more than anything else, illustrates the difference between a long-term program and that of the average sharecropper. The latter wouldn't need it. He would have no cow, no hog, no chickens to eat it, and would be relying entirely upon the landlord to keep him in "sow belly, sorghum and corn meal" until cotton picking time rolls around.

Next year will be better, the Whites say. But business men can afford to consider the present. This year—today—one tenant farm family bought machinery, equipment, seed, household goods, clothing, and canning supplies and paid some merchant, some jobber, some manufacturer, a profit. They absorbed, instead of creating, a surplus.

Five years from February 2, 1938, the White family should have cash to pay rent on the best farm in the county—or perhaps make the down payment upon one of its own—still good customers for business men.

The Oklahoma Gas & Electric Co., meanwhile, will have a property that will pay taxes and a good profit, without squeezing any farmer. It will have sale or production value which it didn't possess before—net profit!

The possible variations upon the lease are many. But whether it is a new rock house, new soil, or net profits from good land that a landlord wants, or a profitable partnership with a tenant, it is possible under tenantry.

# National Defense

**Condensed from The Southern Planter**

*Dr. Lee A. Strong*

**Chief, U. S. Bureau of Entomology and Plant Quarantine**

TODAY we are hearing of National Defense in terms of battleships, airplanes, tanks, and standing armies. But are these the last words in national defense? Who would dispute Napoleon's statement that "an army moves on its stomach?" Can any nation claim to have a national defense if it cannot stand a blockade? We must defend our national food supply.

Even in times of peace there is still the demand for a national defense—a national defense against a foe that annually takes a toll of between two and three billion dollars worth of our agricultural produce; a foe that has no common system of attack but might be said to have infantry, cavalry, air forces, navy, and even subterranean forces attacking from underground.

The largest insects in our country are but a few inches long, most of them are under 1 inch, but in numbers they outrank all other living things. In this country alone there are 79,800 different kinds of insects, but this number sinks into insignificance when we consider their ability to reproduce. The little vinegar gnats often seen flying around the jars of canned fruit would bury this earth a million miles deep with their dead bodies in the course of a year if they all lived to reproduce, and if none of them decomposed.

It has been estimated that a single female aphid in the course of 5 months produces enough

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aphids to weigh over 822 million tons. Of course one generation is practically gone before another generation is mature so but comparatively few are alive at one time and after death they soon disintegrate. It is this ability to reproduce so rapidly that makes insects such formidable foes.

Two billion dollars is a lot of money. It is one-third of the sum collected by the Federal Treasury last year. But even more important than this vast sum of money is the drain on our soil fertility in growing 100 million acres of crops for insects to eat. It has been estimated that for every 10 acres planted to cotton 1 acre goes for insect food. To grow an acre of cotton takes, on an average, nearly 21 pounds of nitrogen, 7 pounds of phosphoric acid, 10 pounds of potash, and over 6 pounds of other fertilizing elements from the soil, elements already there as natural soil richness, or supplied by fertilizers. The terrific task, of planting and cultivating crops for insects to destroy amounts to the labor of two million farmers giving their entire time.

The "infantry" of the insect world consists of such wingless pests as the Mormon cricket, which swarms out of the waste lands of the Inter-Mountain region and western Great Plains into the cultivated fields, often materially damaging crops; and the white-fringed beetle, an insect recently introduced from South America, which threatens the agriculture of limited areas in the Gulf region.

Their "cavalry" consists of such mounted insects as the ticks that bear Rocky Mountain spotted fever and other diseases of man and animals, and that ride on rabbits and other small animals; the fleas that carry bubonic plague and ride on rats; and the many plant diseases that ride on bark beetles, cucumber beetles, and such mounts.

Grasshoppers, cotton aphids, the boll worm, the boll weevil, and the leaf worm ride into our fields on their airplane wings. They are the air forces of the enemy.

Mosquitoes, those bearers of malaria, yellow fever, and several other diseases, constitute the "navy" as they spend all their youth as wrigglers, swimming about in water. Finally, there is the underground army of white grubs, wireworms, sweet potato weevil, and a host of other insects that eat off the roots and burrow into the tubers of our crops.

The research entomologists, have shown us the enemy's strength. What is our national defense against such a foe? The "War College," in Washington, is the Bureau of Entomology

and Plant Quarantine, Divisional Headquarters are in the several States at the Department of Agriculture, the Agricultural Experiment Stations and Plant Boards, and at the 300 field stations of the Federal Bureau. This army of defense is constantly investigating insect pests, discovering their most vulnerable points, introducing natural chemicals and other materials that will destroy these insects.

How is the warfare carried on? It is usually not sufficient that the enemy be routed as, owing to its enormous powers of recruiting new forces, the struggle is perpetual—practically every year insects attack our crops to such an extent that, were they not controlled the efforts of the farmers to produce profitable crops would be nullified. At one time the cotton boll weevil threatened to destroy the cotton-growing industry of this country. Research work developed means of modifying the farm practices in the South by diversified farming and by the use of calcium arsenate dust, so that today cotton can be produced throughout this area.

The development of spray programs have made it possible to produce clean fruit in the face of attack of such terrific enemies as the codling moth and the plum curculio. Such practices as these, however, cost money and reduce the farmer's margin of profit. It is now the constant aim of the scientists engaged in insect control work to discover more effective poisons and even to eliminate the use of poisons in insect control, so as to reduce to a minimum the expense involved in these operations.

Insecticide chemists have gone into the field of organic substances and have given us rotenone, phenothiazine, and bentonite, and a number of other substances highly efficient as insecticides, but not dangerous to man. Cultural practices have been developed which, in some cases, eliminate the use of an insecticide. For example, by detailed studies of the life history of the Hessian fly it has been found that if wheat is planted after a certain date the flies will all have emerged, laid their eggs on unsuitable plants, and died, therefore the new wheat coming up will be free from their attack.

Scientific research and experimentation have developed varieties of plants that resist insect attack. We have varieties of sugar beets resistant to curly-top, wheat resistant to Hessian fly, corn resistant to chinch bug, and alfalfa resistant to leafhoppers.

It has been estimated that the major insect pests in this country occasion a loss of $1,600,000,000, a little over half of the total estimated loss occasioned by insects. Of these more important pests,

about one-third are aliens and it is further estimated that these alien pests cause an annual loss of over three hundred million dollars.

Our coast fortifications to prevent reinforcements in the form of foreign pests is the foreign plant quarantine service. Here we maintain at every important port of entry a staff of trained inspectors who examine all plant material likely to bring in insect pests of foreign lands. We have records of over 20,000 of these. If any of these pests are found, the shipment is promptly returned to its point of origin, or the material destroyed.

In this work over 300,000 interceptions of insect pests have been made—300,000 aliens attempting to pass our fortifications, any one of which were it introduced might prove to be as serious as some of the pests that have already entered.

"Concentration camps" are maintained in the form of quarantined areas where certain foreign pests have established themselves in this country and where we are attempting to prevent their future spread. Examples of this type are to be found in New England, where the gypsy and browntail moths are interned; in Southern and Middle Atlantic States where the Japanese beetle has its stronghold; and in Texas where the pink bollworm is under duress. All articles likely to result in the moving of these insects are carefully inspected and certified before they can be shipped out of the area, or are so processed that no insect could live in the shipped product.

In cases of extreme emergency the Federal Government attempts large-scale control projects. During the last few years terrific outbreaks of grasshoppers and Mormon crickets have occurred in the Great Plains and Rocky Mountain regions. To combat the grasshoppers, the Federal Government supplied the farmers with 202,900 tons of bait and as a result protected 176 million dollars worth of crops. To halt the Mormon crickets, over 300 miles of tin barrier was placed in their path and this kept them out of 1,375,000 acres of crops.

The war between man and insects will probably never end, new phases of the problem are constantly demanding investigation but entomologists have now proved that the insects will never dominate man, for whenever occasion arises he can provide the necessary national defense. To do this, however, the entomologists must have the necessary financial sinews of war, as must the military organizations, in providing their part in the National Defense.

# New Uses for Fruits

Condensed from American Fruit Grower

*Dr. H. E. Barnard*

**Director of Research, National Farm Chemurgic Council**

IN the last few years the recognition of the importance of finding uses for fruit which is not suitable in grade and quality for the commercial market has made remarkable progress. Fruit growers are familiar with the efforts of the National Apple Institute to develop a research program. They have discussed the subject at their annual meetings and they have watched with much interest the developing program of the regional research laboratories which will shortly be established in the four major sections of the country. They know that the eastern laboratory lists a study of apples as the first of its five major projects! The tentative research program for this laboratory in outlining its study of apples lists as its objective the development of new, and the improvement of old, industrial uses for apples and apple products. A second major objective relates to fruits and vegetables which will be studied in a similar way. Berries, cherries, grapes, peaches, and other fruits are included in this proposed research program. In the study of apples, special attention will be given to the preparation of juices and dried pulp. A special study will be made of the preparation of alcoholic beverages, higher alcohols, and organic acids from apples and apple products. The physical and chemical properties of pectin, an important apple ingredient, will be investigated, in the thought that new and improved uses may be found for it.

In organizing its tentative research program, the U.S.D.A. asked many research organizations and the land grant colleges and state experiment stations for help in drafting a sound program.

During the last few years, amazing progress has been made in developing practical methods for extracting, preserving, and marketing all types of fruit juices. In 1929 a little more than 1,000,000 cases of fruit juice were packed. Last year 24,000,000 cases were produced.

"America drinks its fruit," according to Gordon Ockey, of the Federal bureau.

**Reprinted by permission from the American Fruit Grower, Cleveland, Ohio**

Prior to 1929, grape juice and sweet apple cider were the only unfermented fruit juices consumed insignificant quantities. Little tomato juice was then consumed, and commercial production of grapefruit juice, pineapple juice, orange juice, lemon juice, and various fruit nectars was yet to be developed. In contrast, almost 24,000,000 cases of fruit juices were packed last year, and more than 16,000,000 cases of tomato juice. Citrus juices comprised about one-half of last year's high record fruit juice pack, with grapefruit juice making up about three-quarters of the citrus juice pack.

Ockey reports that in the past few years juices made from dried prunes, loganberries, cherries, raspberries, and strawberries, and nectars made from apricots, peaches, pears, and fresh prunes have been produced in increasing quantities.

Increased production of juices is attributed to two factors: increased consumer demand for juice products, and increased supplies of fruit, resulting in the necessity of increased diversion of fruit from the fresh market to by-product use.

For several years the Bureau of Chemistry and Soils of the U.S.D.A. has maintained a fruit by-products laboratory at Pullman, Wash. At this laboratory Dr. H. H. Mottern, chemist of the Food Research Division, has achieved considerable success in preparing apple sirups and apple juices.

The principal progress which this laboratory has made in utilizing apple products has been in canning juice using enzyme clarification and flash pasteurization similar to that developed for citrus juices. A method recommended as commercially feasible for canning apple juice has been developed. The American Can Company's grape juice can which has the special enamel developed for wine has been found to be the most satisfactory.

A dried apple product called "apple pear,' which is essentially a dried apple sauce, has been attracting a good bit of attention in Wenatchee, Wash. It is used by bakeries as a bread improver with the claim that it results in a shorter fermentation period and delayed staling and also aids in preventing ropiness in dough. It is prepared by cooking and sieving apples identical in the manner in which apple sauce is prepared for canning; no sugar is added, however. The cooked sauce is spread on a stainless steel belt which passes through an electrically heated drying tunnel. It is removed from the belt while still warm and pliable and packed into paperboard boxes lined with wax paper.

Pederson and Tressler, of the

New York Experiment Station, found that apple juices prepared from tart or acid eastern apples can be flash-pasteurized and canned at 160 degrees F. or higher. Holding pasteurization of 15 to 20 minutes results in the killing of yeast at 155 degrees F. or higher. It is unnecessary to kill all micro-organisms present in apple juice since the bacteria that survive the above temperatures cannot grow, and the surviving mold spores may be held in check by the absence of air. Pasteurization at temperatures above 175 degrees for one minute imparts a slight cooked flavor to cloudy New York State apple juice.

Canning of a deaerated and flash-pasteurized cloudy apple juice as described by the authors is a simple procedure by which a juice of far more and far better flavor is produced than by any preservation process now employed. It is believed that the method has great commercial possibilities.

Apple cider preserved by several processes, and packaged in glass as well as tin, is now a commercial product. Such work as that reported by Pederson and Tressler is certain, in the course of time, to develop wholly satisfactory ways for placing apple juices before the consuming public in as desirable a form as the other fruit juices.

The possibilities in concentrating apple juice by removing much of the water content are considerable. Dr. Mottern has developed a practical way by which to collect the volatile esters which impart flavor and bouquet, and to return them to the sirup. The product thus made has a fine apple flavor, and there is good reason to believe that it will in due season take its place as a table sirup, beside maple sirup and cane sirup.

Fruit breads are not uncommon. Breads containing figs, prunes, and bananas have been made and marketed as special products with unusual qualities either in the therapeutic field or because of other interesting values. Bread made with apples is now finding an increased sale in the Northwest. Breads containing apples in the form of apple sauce are not to be classed with fig, date or raisin breads, since the apple content is not obvious either in the taste or physical appearance of the loaf. In making the doughs the water content is reduced by the amount added in the apple sauce. The apple pectin and the apple sugars improve the colloidal condition of the crumb and so delay staling of the loaf. The texture is also improved. One formula using 20 per cent of apple sauce is copyrighted and is used in making a bread known as "Appeal" bread.

The apple bread will not be

available from bakeries until apples are prepared in a form permitting quick and easy use in the bake shop. The product referred to in the letter from Dr. Mottern as a dried apple sauce may meet this need. If, however, an apple powder can be developed which will impart less color to the loaf, it will perhaps better serve the demand of the baker for a standarized material which, when added to the dough batch, has no effect on the color of the loaf.

By virtue of its superior natural qualities, fruit has become one of the principal raw materials of the frozen foods industry. In original form, or converted into special products, fruit retains its flavorful attractiveness in the frozen state. Notable work is being carried on by the University of Tennessee engineering experiment station on a new method of freezing fruits, principally strawberries and peaches.

I have mentioned some of the important research studies which are now under way. It should be remembered that time is an essential factor in the development of industrial uses. After results have been reached in the research laboratory, pilot plant operations are necessary to prove their practicability, and after that capital must be shown the economic value of the discovery in order that commercial plants may be built. Until factory operations are profitable, all research programs will be of little value except as they are contributions to the storehouse of knowledge.

## Making Pump Repairs

Hammering and surging of shallow well pumps is often due to worn, crusted or warped valves or worn-out piston leathers. Such conditions result in poor economy in operation, undue strains on motor and parts and are warnings of imminent failure.

Repairs can be made in less than an hour on most units. This includes removal of the inlet and outlet valve assemblies, removal of the piston through the end of the cylinder and the thorough scraping and flushing out of all parts.

New piston leathers are recommended every other year of average service. New leathers are best softened with neat's-foot oil. Washers under the valve and cylinder covers should be replaced if hardened or compressed. Cup grease is used on these to insure a water-tight joint.—*New Jersey Farm and Garden*

# Measuring Logs

Condensed from Rural New-Yorker

*Harold Cahill Belyea*

IN the early days, in New York State, logs were brought and sold by the cubic foot. We know this from the records in colonial documents and especially from Governor Dongens' report of 1694. He was much concerned with the disrepair into which the forts of the towns of the newly captured colony of New York had fallen. Logs and stockade poles for their reconstruction were purchased by the cubic foot, while boards and planks were bought by the lineal foot. The practice of measuring logs in terms of the cubic foot persisted down to the early eighteen hundreds, and seems to have been common practice as late as 1820. In some of the more remote sections, this practice lingered much longer. In 1869 the Crown Lands regulations for the Canadian Province of Ontario called for the collection fees at so much per cubic foot.

The beginnings of the great American sawmilling industry were in New York State. In 1623, nine years after the first settlement, there were three sawmills in Nieu Amsterdam. These mills were erected by the Dutch West India Co., with machinery shipped over from Holland. By 1645 there were upwards of ten sawmills in the Hudson Valley between Governor's Island and Fort Orange (Albany). These mills were of crude construction and small daily capacity. A large sash saw working in a frame was attached to the pitman or walking beam of a single overshot water wheel. Boards and planks were sawed to specified sizes and were sold by the piece on a quality basis.

As lumber markets and centers of distribution and shipment developed certain standard board sizes were associated with the lumber produced in or adjacent to that town (the "Albany board" was 13′ x 10″ x 1″). Since boards were manufactured and sold for the purposes of building construction it was only a step to reckon the boards in terms of the area to be covered. Somewhat fragmentary evidence indicates that the practice seems to have been to sell boards by the "square," meaning a square 10 feet by 10 feet, or 100 square feet of superficial area. When, however, large quantities of boards were involved, as in lumber shipments to distant markets, the square seems to have been too small a unit for

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convenience, and 10 squares, or 1,000 superficial feet, called board feet, were adopted as a minimum unit of count. In this form it has come down to us in this present day.

But between 1820 and 1825 there seems to have been rapidly adopted by the lumber industry the practice of purchasing logs, not according to the wood material contained therein, as expressed by their cubic footage, but on the basis of the number of superficial feet of board material that it would be possible to saw out of the log, that is, their board foot yield. This practice had the advantage of giving information to the mill man of his anticipated return in terms of one-inch boards. It was a unit which absolutely ignored the waste incidental to the manufacturing operation, and as such discriminated against the producer of the log material since the anticipated return on his logs was taken out of his control and was a matter of the efficiency of the mill man and his mechanical set-up.

Many attempts have been made to set up equitable standards for measuring logs in terms of board feet. We call them log rules. The fact that out of more than 100 such attempts since 1825, only three or four log rules are in common use today is evidence of the fultility of attempting to measure logs in terms of board feet. Its fundamental weakness is that it is a process unit and not a raw material unit.

After all, a thousand board feet in the logs is a very artificial and meaningless thing. To begin with, it is potential rather than actual and cannot be defined within the limits of absolute volume. It is larger with some log rules than it is with others. It varies from job to job and on a single job or within a mill, from day to day according to the log run. It varies with the range of diameter and length sizes and also with the relative distribution of sizes within such range. It varies with the selective skill and personal efficiency of scalers and, granting equal skill among scalers, it varies with relative freedom of the logs from abnormalities and defect. It varies with the skill of the sawers and the efficiency and character of the sawmill machinery. It varies with the methods of sawing and the widths and thicknesses of the lumber produced. It has no meaning whatsoever when applied to veneer logs, pulpwood, railroad ties or mine timber. What is really needed is a unit of measure for log material which is simple in its application, is not presumptuous or preemptory regarding the finished product and obviates the necessity of the acceptance of the factor of perennial dispute in the matter of over run.

The writer is strongly of the opinion that such a unit could be found in the adoption of the cubic foot as the basis of measuring the wood material in logs. In this connection it might be pointed out that there are known to the writer several cases in the state where such unit has been voluntarily adopted by certain manufacturers using logs as their raw material. The use of the cubic foot in measuring forest products has many precedents. It is in common use in Central Europe, in France, in Switzerland, in Scandinavia, in South Africa, in parts of the Far East and in Australia. It is used on national forest timber sales in Alaska, and it is the official unit of log volume measure in the great lumber producing province of Quebec. A great many arguments might be advanced in favor of the cubic foot. The more important of these seem to be:

1.—The cubic footage within a log can be obtained as a precise mathematical value of absolute magnitude and not as a theoretical or potential or estimated yield in terms of some processing unit. It will thus mean the same thing at all times and in all places and not be subject to the vagaries of individual board foot log rules or varying degrees of efficiency and skill in the processing of the logs into lumber.

2.—It is no more difficult to obtain the cubic footage than it is the board foot yield of logs. Cubic foot volume, whether to obtain the volume of the whole log or to cull out defects can be easily and simply computed. The immediate effect of the adoption of the cubic foot would be to standardize the entire system and practice of scaling logs, a practice which at the present time in New York State is neither uniform nor accurate.

3.—Since the cubic foot volume is an absolute value it lends itself more easily to standard methods of accounting, particularly determination of daily production costs than does the variable board foot. Its use would avoid both the disparity and the confusion existing between log scale and mill tally in all bookkeeping transactions, appraisals of value, and business negotiations.

4.—The use of the cubic foot requires no assumption as to the kind of product to be made, nor to the intensity of utilization nor efficiency of manufacture. The conversion from the cubic feet to the unit of measure appropriate to each manufactured product would involve less uncertainty than that now experienced in converting log scale to mill tally. Each mill would work out its own conversion figures based on its own mechanical set-up and technical skill in operating it. There would be no assumption in re-

gard to an anticipated bonus or unearned increment accruing from the deficiencies of an inaccurate log rule. It would set up within each manufacturing plant a definite standard of milling efficiency, namely, the yield of derivable product per cubic foot of raw material.

5.—To the owner of standing timber, the farmer with logs to sell, it would definitely measure the precise quantity of wood material in the log. This value is absolute and not subject to two or three or more interpretations dependent upon which board foot log rule was used in its scaling. There is thus banished all consideration of that surreptitious hang-dog of perennial dispute between sellers and buyers—over run. With the cubic foot there will be no over run and there will be no under run. Commercial transactions then will be on the basis of the exchange of an absolute quantity of raw material in the log for an absolute quantity of money.

The determination of the cubic volumes of logs is a relatively simple procedure and requires nothing more than a knowledge of plain arithmetic. The length of the log in feet and the average diameter of the log inside the bark at each end is determined by actual measurement.

The next set-up is the reduction of these average diameters in inches to sectional areas in square feet, that is, areas of the circles corresponding to these mean diameter values. This can be done by squaring the diameter and multiplying by .7854 and dividing the result by 144. The value .7854 is obtained by dividing "Pi" by 4—

Area of circle in square feet = $\frac{\text{"Pi"} \times D^2}{4} \div 144 = (D^2 \times .785) \div 144$

"Pi" is a mathematical value designating the ratio between the diameter and circumference of a circle. Its value to four places of decimals is 3.1416. These values are usually known as *"B,"* the basal or sectional area in square feet at the larger end of the log, and *"b,"* the basal or sectional in square feet at the smaller end of the log. Then if we know *"L,"* the length in log in feet, we can get *"V,"* the volume in cubic feet from the following formula:

$$V = \frac{B + b}{2} \times L$$

While the calculation of *B* and *b* in the above formula present no great difficulties, the more common practice is to look them up in a set of tables. (A table of "Areas of Circles in Square Feet" may be found in "Foresters Tables for New York State," Bulletin No. 14, New York State College of Forestry Publications, Syracuse, N. Y., 1927, Table 150, pp. 158-159. These tables are to

six places of decimals. As a rule in commercial work three places of decimals will be sufficiently accurate.)

The only caution that needs to be noted is that, in measuring for cubic measure, diameters are read and recorded to the nearest tenth of an inch and not cast off to the nearest full inch below as is customary in board foot measure. Similarly, measurements of length are read to the nearest tenth of a foot. This practice of reading to tenths makes the subsequent calculation much easier than it would be with quarters, eighths or sixteenths.

# Sexing Is Sound

Condensed from The Poultry Item

An Interview with

*Freda Parks Woodruff*

Leading Authority on Sexing in the East

CHICK sexing is one of the latest developments in the rapidly expanding field of practical poultry science. It hardly seems possible but nevertheless it is a fact that five short years ago it was an accepted fact that the sex of chicks could not be told till they approached sexual maturity. Now we regard it as commonplace to purchase either day-old pullets or day-old cockerels all because a clever Japanese professor discovered that chicks could be "sexed" or sexually separated at hatching time by a person who knew what to look for and where to look.

The first chick sexing done in the United States was in the spring of 1934, in an experimental way on the Pacific coast. Here there was an especially great need for sexing as the poultrymen were necessarily white egg producers and the Leghorn cockerel was definitely a problem, as there was no broiler market.

The first American class was composed of financially responsible people. These pioneers in the work found it difficult to learn from the Japanese, due to the fact that the Japanese were not supposed to teach the white people and also due to the difference in language. About 20% of this class reached a running accuracy of 90%.

It was in the second group of students that Mrs. Woodruff received her training. This class was composed of owners of large hatcheries, and all except Mrs. Woodruff were from west of the Mississippi. Only a few of this

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class personally continued with the commercial work.

To find well qualified teachers is another difficulty in this trade. In the fall of 1934, a large English Hatchery came to this country looking for a sexing instructor and after giving tests to a large number of candidates, they found that there was practically no one in the East qualified to sex chicks, let alone to teach others to do so. The English representative, in desperation, went to the United States Department of Agriculture, who suggested they look up Mrs. Woodruff.

Continuing the story in her own words she said: "We met these people at Mrs. Misner's poultry farm, at Williamsport, Pa., and there I took a test on 300 chicks. All of these chicks were killed to actually determine their sex. The test was 96% accurate, which was considered fine after teaching until 4 o'clock in High School, driving to Williamsport on wet roads and then sexing these chicks with people looking on as if I were a freak. This meant that I was to resign my position as Vocational Instructor and go to England immediately to teach a class of English students."

The biggest drawback at the present time to the sale of sexed chicks is the scarcity of good chick sexers. This scarcity is due to several causes, chief of which is the difficulty of learning to do the work with a high percent of accuracy, according to Mrs. Woodruff.

"There are general methods under discussion for sorting male and female baby chicks," according to this authority. "The government method is all right for sorting a perfect female and a perfect male, but one cannot make the readings for border-line cases.

"Another is the method using glasses, which is a form of the Japanese method plus a special set of glasses.

"The third is the Japanese. Here there are again two schools in use: Yogo's, which is very difficult to learn, but easier on the chick and faster for the sexer, and the thumb method which is employed by people with, large slow hands.

"The learning of this art would be very simple if the chicken, like the mammal was definitely a male or female. The sex of the chick is determined by a small spot or eminence located on the very rim of the vent. Its presence or absence, shape and size, are the things which the sexer looks for in determining whether the chick is male or female. The chick may be a perfect female with no eminence.

"However, in practice approximately 80% of the females have definite eminences, which can

easily be mistaken for the male eminence. The amount of moisture in the chick at the time of hatching causes some of the females to look like males or vice versa, and must be compensated for by the chick sexer's judgment. The age of the chick after hatching causes changes in the size of the sex organs which the sexer must allow for, and to make the learning still more complex, strains and breeds differ. In one strain of White Leghorns a certain large type of eminence will be a cockerel. The same eminence in another strain of Leghorn will always be a pullet. The teaching of this takes much practice.

"Speaking of practice, few people realize how much practice it really takes to become a good chick sexer. The first week I devote to the students learning to hold the chick correctly without injuring it. What incidental knowledge is learned, well and good. Then they must learn to decide quickly whether it is a male or female. Speed or number of chicks done per hour is absolutely necessary as these chicks must be sexed, sorted, shipped, delivered and fed before they are 72 hours old.

"In addition to the six weeks training period usually recommended I consider a student should work a full season in a hatchery before he can be considered a commercial sexer, and during that time he should handle 200,000 chicks.

"Another cause for scarcity of good chick sexers is probably the expense of learning. I know that this was a prime consideration back in 1934 when I was considering learning. At that time it was necessary to journey to the Pacific Coast and the expense of a trip of that sort, in addition to the fee for the course, practice chicks, board, and incidentals, looked rather formidable. Stories were being circulated at that time also that the white people could never learn to sex chicks. The expense being so considerable, we naturally considered sending one of the family and it fell my lot to go.

"The personal element to some extent enters into determining the the degree of accuracy which an individual may attain in sexing chicks. All people do not make a success of sexing chicks. In one large hatchery in the east, 30 students were instructed during the hatching season, *the best two were kept.*

"The hatcheryman and the chick grower both demand accuracy from the sexing work. It is quite essential that the cockerels are as accurately sexed as the pullets. Frequently if the sexer guarantees only the pullets, he will put the doubtful ones in the cockerels. Many of the doubtfuls are pullets. For the hatcheryman,

this is disastrous. Chicks which are really pullets and worth 16 to 25c each, are drowned or sold cheaply as 'cockerels.'

*Does It Hurt the Chicks?*

"Visitors or patrons of the hatchery frequently say to me as they stand by waiting or watching me sort the pullets from the cockerels: 'You don't hurt the chicks at all!' To me that always seems a strange remark for if the sexer is properly trained and can do at least 500 per hour and have proper manipulation of the vent, there is no injury to the chick. The only danger is to employ insufficiently and improperly trained people to do your sexing.

"Properly trained sexers are very scarce. There are only four or five properly trained Americans in the East. Due to this scarcity, and to the high cost of these specifically trained people, only a few hatcheries can hire a full-time sexer. Some people, either through lack of knowledge or business reasons, say that sexing injures the chick. This is not true—if you employ a well trained and seasoned sexer."

Certain individual sexers have attained speeds of 700 to 1500 per hour, but only do they obtain accuracy combined with speed after several years of practice.

# There Is No Substitute for Soil Fertility

Condensed from Better Crops With Plant Food

*William A. Albrecht*

Missouri College of Agriculture, Columbia, Missouri

CROP growth depends on the usable stock of plant nutrients in the soil, or on that made available during the growing season. Crop rotations represent good soil management because they lesson the rate of plant nutrient depletion from the soil. Legume crops and grass sod covers are considered particularly effective in this respect because of the slower rate of soil nitrogen exhaustion in the former and because of the partial return of the nutrients to the field as animal droppings in the latter. Considered then purely from the crop-combination viewpoint, one can readily reason that any approach toward constant legumes or constant grass cover will approach satisfaction in terms of lessened soil depletion.

The short rotations of the cereals with newer legumes and the lessened soil tillage that have be-

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come popular in Missouri are built, in part, on this reasoning. A barley-lespedeza combination is 50 per cent legume, for example. Their satisfaction, however, is not in the crop combination without soil treatment. It must take into consideration the facts, (a) that a soil is being exhausted by any crop order or arrangement under soil management that disregards fertility return; (b) that legumes are ravenous consumers of calcium, magnesium, phosphorus, potassium, and others; (c) that they are nitrogen fixers rather than only soil nitrogen consumers when generously supplied with calcium and the other essential soil bases; and (d) that grass sod or non-leguminous crops, as well as legumes, are becoming less effective for their own preservation, or for forage feed production under increasing soil acidity, or, rather, base deficiency. In our present desire for more sod cover and more legumes, especially those growing on less fertile soils where we are expecting them to demonstrate their soil-saving results, we may well recognize many soils too low in calcium, phosphorus, and other nutrients before these crops can get even a "toe hold" in rejuvenating effects on the land.

The short rotation combinations of the cereals, barley or wheat with the more popular legumes, such as soy beans, Korean lespedeza, or possibly sweet clover, have been recently adopted for their soil cover value and their pasture extension over the main portion of the calendar. Their provocation of discussion of the subject of rotations has brought with it a recognition of the need for fitting crops to the fertility of the soil as well as into a particular rotation, or crop sequence. Soil fertility depletion has brought us to wheat and barley, in the place of oats, as nurse crops for legumes. This is true because the former two draw much of their needed nutrient supply in their young growth in the fall of the preceding year and lessen competition with the young legume during its first and the cereal harvest year. The oats are the poorer nurse crop, because they "get there first," so far as fertility is concerned, in the same season as the legume. They stay on well into the summer and make it difficult for legumes to succeed in the soil already sapped before they get underway at their delayed and possibly dry season. This shift to nurse crops that get off the land early is acceptance of the evidence of crop competition for a fertility that is getting too low to support both crops at the same time. It commonly places the blame on factors other than the soil, such as the seed or the season. The same

declining fertility that has been too low for two crops at the same time has not only been obliterating the legume completely, but has also been lessening the productivity of the cereal, or non-legume, crop itself.

Fertilizers have been recognized as a serious need for the cereals. Superphosphate on wheat has been a safe investment in most parts of Missouri and has extended its effectiveness by establishing the legume nursed by the wheat. Now that drilling fine limestone with the wheat for clover the next spring shows liming beneficial on the wheat in the fall, as well as on the clover the succeeding year, we may remind ourselves that superphosphate of the past contained so much calcium that this element was perhaps doing much of the benefit for which phosphorus was getting the entire credit.

The graminiae, or grass family, on many of our soils respond to the calcium in limestone more than anticipated. Oats reflect the effects of lime additions in their growth, and even corn demonstrates the influence. Limestone serves to mobilize the nutrients into the plant. Fertilizers alone on corn mobilized phosphorus into the crop only one-third as effectively as when used in conjunction with limestone, according to chemical studies of the crop.

Parallel with the increase of phosphorus went an increase of calcium in the fodder crop. Barley, used extensively in conjunction with lespedeza, also reflects the beneficial influence of the phosphate and limestone treatments. Its earliness makes it the best of all nurse crops to draw its fertility the preceding season and leave a liberal supply for the lespedeza after the barley harvest. These cereal crops reflect the effects, particularly in composition of their forage, of the lime and phosphates to remind us that, in arranging rotations, the fertility of the soil may be a factor to determine the crop efficiency as well as the crop choice. They tell us that we cannot escape the fertility shortage by offering substitute crops.

Fertilizers for the legume in the rotation tell the same story as for the cereals, only with more emphasis. In our search for legumes which manage to grow on thinner soils, those so found must do so at a lower rate of fertility consumption by giving correspondingly lower yield rates, or smaller offering in the lower concentration of feed nutrients in the forage. Of course, lowered levels in all these are still better than complete crop failure.

Less calcium concentration in the legumes because of its depletion from the soil means less phosphorus mobilized into the

plant. It means lowered concentration of protein in the forage, the tonnage yield of which means less protein yield per acre. So when these legumes make tons, it is well to appreciate the need for some test by which we can learn whether they are rich enough in such ash constituents as lime, phosphorus, potassium and others, or whether they are giving protein and items that do more than merely distend the consuming animals' paunch.

Declining soil fertility is reflected in natural vegetation by lowered yields within the same plant kind, or its disappearance and the incidence of such other kinds as can grow by using less nutrients from the soil. Such as make their advent into—and maintain themselves in—the ecological array at the lowest soil fertility level may be expected to be of low concentration in protein and ash. They must then be of low feed value as suggested by their refusal as forage by wild animals. The declining calcium, in particular, in conjunction with a moderately constant potassium level suggests the shift from the proteinaceous to woody plant composition even within the legumes. The same is indicated for the non-legumes to the point where wood production by trees may represent the extreme in calcium reduction in the calcium-potassium ratio. Naturally such also represents the lowest feed value as forage.

In disregarding soil fertility decline, represented by the large calcium depletion to give a narrowed calcium-potassium ratio, we are in danger of accepting forages of lower protein and lower mineral content irrespective of the crop combination into rotation schemes. Crops in short rotations, like any others, respond to soil treatments and are no escape from the facts that soil treatments can be beneficial to them.

## Straightening Warped Boards

I have taken the warp out of many boards in the following manner: Lay them, hollow side down, on the damp ground or grass, keep the upper side wet. Unless they are too bad this will bring them straight at no expense.—*G. C. S., Rural New-Yorker*

# The Digestion of Nutrients

Reprinted from Poultry Husbandry

*Morley A. Jull*

Prof. of Poultry Husbandry, University of Maryland

SINCE most of the nutrients in feeds are not absorbed by the fowl's body in the form in which they occur in seeds, it is obvious that these nutrients must be "broken down" before they can be converted into the nutrients found in the body tissues and secretions of the body. The process of digestion includes all of the changes that take place in the feed from the time it is consumed until the nutrients in the feed are in proper form and condition to be absorbed by the blood for assimilation by the tissues of the body.

*Feed Passage through Digestive System.*—The digestive system of the chicken has been described in Chap. II (The Biology of the Chicken), so that at this time it is necessary only to trace the various steps that feeds take in their passage through the digestive system. Feed picked up is swallowed with the assistance of the tongue and is forced through the digestive tract by means of muscles in the walls of the tract. If the bird has had no feed for several hours, the first few mouthfuls swallowed pass directly into the empty gizzard, reaching that organ in about 15 to 30 sec. after being picked up. In the case of birds that have been feeding regularly, however, a fresh mouthful of feed when swallowed passes down the gullet and into the crop, which continues to receive feed as long as the gizzard is full or partially full. As the feed passes from the crop to the gizzard, it usually pauses in the proventriculus for a period of approximately 7 sec. Small quantities of feed take relatively a longer time to leave the crop than larger quantities.

Upon reaching the gizzard the feed is ground into a fine mass by the rhythmic contractions and relaxations of the gizzard, the pressure in grinding being very great. After the gizzard has ground the feed completely, it passes into the small intestine, where it is thoroughly mixed and brought into intimate contact with the intestinal wall.

The feed mass passes from the small into the large intestine at the juncture of which the caeca,

two blind pouches about 5 in. in length, open into the intestinal tract. The caeca rhythmically expand and contract and thus receive and reject the fluid contents of the intestine. The fluid-like feed mass passes along the large intestine until it accumulates at the cloaca, where portions are expelled at intervals.

From the time that feed is picked up by the laying bird approxmately 2½ hr. are required for the feed mass to reach the cloaca. The rate of the passage of feed through the digestive tract of the adult hen not in laying condition is considerably slower than in the hen in laying condition, being about 8 hr. In the case of the broody hen the rate of passage is about 12 hr.

*The Process of Digestion.*— During the process of digestion the carbohydrates, fats, and proteins are "broken up" into fine particles by the secretions of various glands that are present in different parts of the digestive system. These glands secrete ferments or enzymes, which have the remarkable ability of bringing about changes in other organic compounds without themselves' being changed. Their function is to attack the nutrients contained in the feed in order that they may be converted into nutrients which can be taken up by the innumerable small projections, called "villi," that line the intestinal tract and thus be absorbed by the blood stream which connects with the villi. In other words, the starches and sugars comprising the carbohydrates, the fats, and the proteins are "broken up" into simpler compounds which can be absorbed by the body.

The mouth contains many salivary glands which secrete a starch-splitting enzyme called "ptyalin," converting starch in the feed into an end product called "maltose." There are no glands in the crop, which serves largely as a storage sac, but it is in the crop that the ptyalin acts as well as certain enzymes contained in the feed, where it takes on an acid reaction due to the presence of lactic acid. While the feed is in the proventriculus it is mixed with gastric juice containing hydrochloric acid and an enzyme called "pepsin," which reduces the protein in the feed into peptones. The hydrochloric acid contained in the gastric juice secreted by the glands of the proventriculus acts as a solvent on mineral matter, making its final absorption possible.

The gizzard does not contain any glands that secrete enzymes, but it is worth noting that the gastric juice is incapable of digesting the cellulose walls of the various grains until they are ground up by the gizzard. The gizzard acts as a filter so that no

feed passes out until it is finely ground.

The liver secretes bile, which reaches the distal portion of the duodenum by means of two bile ducts, the one from the right lobe of the liver being enlarged to form the gall bladder. The bile emulsifies and dissolves the fats in feed so that enzymes can act on the fats more readily. The bile contains salts which help to neutralize the acid of the gastric juice, thus preparing the feed for further action by the juices secreted by the pancreas. The liver also serves in the synthesis of the uric acid that escapes in the urine.

The pancreas, which lies between the U-shaped loop of the duodenum, secretes pancreatic juice, which gains access to the duodenum by means of three ducts. The pancreatic juice is weakly alkaline in character and contains the enzymes amylopsin, which converts starch into maltose; trypsin, which converts any previously undigested proteins into proteoses, the latter into peptones and polypeptids, both of which are converted into amino-acids; and lipase, which converts fats into glycerol and fatty acids. The glycerol and fatty acids are absorbed by the villi of the intestinal tract and upon being reformed into fats pass by way of the lymphatic system into the blood stream.

Distributed throughout the small intestine are "Lieberkuhn's glands," which secrete the intestinal juice containing the enzyme erepsin, which converts peptones into amino acids. The intestinal juice also contains the enzyme maltase, which converts maltose into glucose; and the enzyme sucrase which converts sucrose into glucose and fructose. Aside from its digestive function, the small intestine also acts as an organ of absorption by absorbing soluble nutrients and inorganic salts.

The caeca aid in the digestion of the fiber contained in feed.

The large intestine serves in the absorption of water from the urine as it is deliverd by the ureters from the kidney. The urine is expelled with the feces in the form of a white paste.

The various mineral nutrients in the feed are usually absorbed from the intestine without undergoing any change in composition. In so far as known, the vitamins are also absorbed directly by the body without undergoing any change.

*Wastage of Nutrients in Digestion.*—It is a significant fact that the nutrients absorbed by the fowl's body to enable it to perform its normal functions and in the formation of new tissues and secretions are invariably smaller in amount than the nutrients that must be supplied in the feed for these purposes.

Rarely is any nutrient contained in the feed completely digested, much less completely utilized. Moreover, the level of feeding affects the wastage of nutrients in digestion, for when the chicken is fed excessive amounts of feed the nutrients are digested less thoroughly than when the chicken is fed a scanty diet. Then, again, nutrients that are not properly balanced in the diet apparently are not digested so well as when they are properly balanced. An excessive supply of any particular nutrient constitutes a wastage in feeding practice because a higher proportion of the nutrient remains undigested than when the optimum amount is fed. In fact, the optimum amounts and proportions of the various essential nutrients in the feeding of poultry for any particular purpose have as yet to be determined.

***The above is an excerpt from Poultry Husbandry by M. A. Jull which we recommend as an excellent book on Poultry. It is published by McGraw-Hill and Co. @ $3.50 and for the convenience of our readers it may be purchased through the Farmers Digest.***

# Have We a New Utility Breed "White Americans"?

Condensed from New England Poultryman

*Ellery E. Metcalf*

Instructor, Essex County Agricultural School, Hathorne, Massachusetts

EXPERIENCE in retailing eggs in an area near Boston taught me the definite preference which New Englanders have for eggs with shells of pleasing brown shades.

In the course of my reading of poultry publications I learned that deep brown eggs produced in Holland are marketed in London, England, under the trade name of "London browns," Further investigation disclosed the fact that a poultry breed known as "Laced Barnevelders" were used by the Dutch to produce these deep brown eggs.

I first saw specimens of the Laced Barnevelder breed and their eggs at the Boston Poultry Show about ten years ago. The birds were black with brown lacing and the eggs were the most intense brown in color of any breed.

A year or two later I learned that a white variety of Barnevelders was being developed by the Dutch from white "sports" or mutations that had appeared in the laced variety.

I was interested in the Barnevelders because of the brown eggs they produced. Four years of breeding Barnevelders enabled me to determine both the weak and the strong points of the breed.

The strain of Barnevelders with which I worked showed the comparative faults of small size, late maturity, low production and high mortality. They would commence laying when only about four pounds in weight and the high mortality I attributed to the probability of inbreeding, due to the very high price of eggs and stock from the first specimens imported to the United States. I find that other poultrymen who experimented with Barnevelders found similar faults with their flocks.

I found that White Barnevelders had much better livability than the laced variety. The points that I found desirable about the

Reprinted by permission from New England Poultryman, Boston, Mass., Jan. 15, 1939

White Barnevelders with which I worked were early feathering, deep brown egg color, non-broodiness, fine meat characteristics, and pleasing yellow skin color.

At the time several years ago when I first conceived the idea of creating a new breed, with Rhode Island Reds and White Barnevelders as the foundation, many strains of Rhode Island Reds were still quite weak in the characteristics of brown egg color, non-broodiness, fine meat type, and yellow skin; the very points for which my White Barnevelders were favorably outstanding.

I considered carefully what would result if a cross was made between White Barnevelders and Rhode Island Reds. I concluded that the interchange of genetic dominant and recessive characters between these two breeds could be made to create, after a few generations, a superior new utility breed which would possess the following major desirable characteristics.

1. Close to 100 per cent fairly uniform brown eggs of attractive shades.
2. High annual production of eggs of good average size.
3. A breed as early maturing and with the average body weight of good strains of Rhode Island Reds.
4. Attractive white plumage, early feathering, and with a pleasing body type.
5. Plump, yellow skinned carcasses, very attractive as broilers, roasters, or fowl because of the full meated breast formation combined with yellow shanks and yellow skin.
6. A minimum of broodiness.

I will list briefly some of the differences regarding the six items mentioned above between the Rhode Island Reds and the White Barnevelders.

The Rhode Island Reds are classed as a brown egg breed but the Barnevelder eggs average many shades deeper brown. Crossing the breeds has resulted in a breed laying eggs shaded more toward the deep brown of the Barnevelders.

The Rhode Island Reds have been bred to a much higher egg production standard than the Barnevelders. The breed resulting from the foundation cross of Reds and White Barnevelders is being bred toward the high averages of the Red side of the parent stock.

The Barnevelders were smaller in size and much later in coming into egg production than the Reds. The influence of the Red side of the cross is resulting in generations of offspring that now average well up to Rhode Island Red standards for age at maturity and body weight.

The red plumage color of the Rhode Island Reds is a "dominant" color while the white plum-

age of the White Barnevelders is "recessive." A cross of the two gives a first generation of chickens that are all colored red and black. As a matter of fact, some specimens in this first, or F-1 generation, in my work proved to look exactly like fairly good colored Rhode Island Reds and a few by contrast resembled brown leghorns in plumage color. There were variations of mixed red and black between these two extremes.

No whites appear in this generation because the white is "recessive" to the color of Rhode Island Reds. However, the chickens resulting from matings of the first generation will give a second generation about one-eighth of which will come white and about one-eighth will come white with some red feathers intermingled. About three-fourths of this second generation are like the first generation parents, red and black in plumage color.

The whitest birds in this second generation will breed true for white and they constitute the beginning of a new white breed, the best specimens of which are mated to produce the third generation, marking a step forward in perfecting the new breed.

My work with this second or F-2 generation included an experiment whereby I used females that showed considerable red in the plumage, but were very desirable in other ways, mated to the whitest males. I found that about one-half of the offspring from such matings came desirably white in plumage color and thereby a way was open to use good F-2 specimens that otherwise would have been discarded on the point of plumage color alone. There were a few individuals, however, whose genetic make-up was such that much of their sprinkling of red feathers passed along to most of their chickens.

Because only about one-eighth of the F-2 generation come sufficiently white in plumage color to warrant their use in producing the third generation I increased my flock in the second generation to over four hundred specimens, knowing that less than fifty of them would meet my severe selective standards in making matings to give third generation offspring that would show desirable progress in developing the new breed. Good luck in getting a sufficient number of desirable F-2 generation specimens for further work marks the successful passing of one major climax in breeding work of this kind.

Matings of superior white birds for the fourth, fifth and sixth generations are made to perfect the various characteristics desired, among which are early feathering and a body type showing good egg production capac-

ity. Attractive, plump, yellow skinned carcasses are characteristics injected into the new breed principally from the White Barnevelder side of the foundation mating.

The new breed does not go through a rangy bony period in growth similar to that period in the development of Rhode Island Red chickens. The new breed shows a plump full breasted body type during all stages of growth. It is thought that this characteristic may be the effect of either "Cornish" or "Dorking" blood which it seems very probable was used in creating the Barnevelders, and through the medium of the White Barnevelders this plump well meated "Cornish" or "Dorking" inheritance has come into the new breed.

The Barnevelders are non-broody to a very high degree. At the time the foundation matings for the new breed were made, Rhode Island Red strains were still characteristically quite broody. Hence in breeding to reduce broodiness to a minimum in the new breed, heavy dependence was placed on the fact that Barnevelders would transmit the non-broody tendency to a high degree.

The sixth generation of the new brown egg utility breed which I now have combines to an encouraging degree the six or more desirable points which I listed earlier in this article.

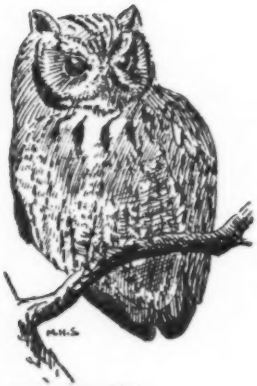
To date the new breed has been show in competition as "Metcalf's White Americans" primarily because they fit into the classifications of American breeds rather than Asiatics or Mediterraneans.

It is interesting to reflect upon what has resulted by combining genetically the desired characteristics of the outstanding American breed, the Rhode Island Red, native to Rhode Island, with the rather uncommon European breed, the White Barnevelder.

# Are They Vermin?

*E. Laurence Palmer*

Prof. of Rural Education, Cornell University



SCREECH OWL

## SCREECH OWL

*(otus asio naevius)*

*Description*—Length, to 10 inches; wing spread, to 2 feet; weight, to 7 ounces. Female, generally larger than male. Wings, short and broad. Distinctive eartufts. May appear short and fat or tall and slender. Two color phases, one essentially gray; the other, rust or cinnamon red.

*Where found*—In woods, orchards, or parks, or even in trees on city streets perched at entrance of nest hole or on branch.

*Range*—Breeds from New Brunswick to Minnesota and south to Georgia and Oklahoma; extended through the United States by some 14 subspecies. Permanent resident.

*Relations and life history*—North American species and subspecies, 17. Family, Strigidae. Nesting begins in April or earlier in a bird box or hollow tree lined with feathers or rubbish. Both sexes may incubate the 4 to 6 white eggs 1.55 by 1.22 inches; hatch in 21 to 26 days into blind, white, downy, helpless young. One brood a year. Adult winter plumage assumed in second autumn.

*Behavior*—Food largely mice. Of 255 stomachs examined, 91 contained mice; 100, insects only; 38, other birds; 1, poultry; 11, mammals other than mice; 21, lizards; 29, miscellaneous, and 43, nothing. It rarely touches game species but feeds on things which compete with game species for food. When insects are abundant they make up the bulk of the food.

*Reaction to heat, light, and moisture*—Active at night and at dusk, calling tremulously or wailing on a rising scale. Active winter and summer. Molts in late summer, with no apparent spring molt.

*Relation to man's interests*—Justly protected by law in New York State; sometimes feeds largely on birds. Term "screech" is hardly appropriate. Might better be called "quavering." Not vermin.

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# INDEX


**Beef Cattle**

Cow Herds Make the Forage Market ..... March, 1938
Herd Production Costs ..... March, 1938
Fattening Calves on Milo Grain .. March, 1938
Beef without Grain ..... April, 1938
Fattening Cattle on Pasture ..... July, 1938
Ranching, 1938 Style ..... Sept., 1938
Making Beef with Ayrshire Steers .. Oct., 1938
Calves Prefer Oats ..... Oct., 1938
Care of the Herd Bull ..... Nov., 1938
Limestone Feeding ..... Nov., 1938
Application of Breeding Laws ..... Dec., 1938
Importance of Breeding Matrons .. Jan., 1939
Feeding Calves for Baby Beef ..... May, 1939

**Conservation**

Perpetuation of Wild Life ..... Nov., 1938
What Has Happened to the Shelter Belt, Dec., 1938
A United Front to Reclaim the Dust Bowl, Dec., 1938
Terraces Increase Yields ..... Jan., 1939
Water in the Ground is Cash in the Bank, April, 1939
Tempering the Wind with Trees ... April, 1939
Sodding with Funnels ..... June, 1939
Farming the Land and Keeping the Soil, June, 1939

**Crops**

Our Old Friend Timothy ..... March, 1938
Rare Crops ..... March, 1938
Danger of Unadapted Clover Seed . April, 1938
An Adventure in Grass Farming .. April, 1938
When There's a Snake in Sudan Grass, July, 1938
Barley's Future ..... May, 1938
Increasing Protein Content of Timothy, June, 1938
Handling Hybrid Seed Corn ..... June, 1938
Hayways ..... July, 1938
Certified Grimm Alfalfa ..... Sept., 1938
History of Hay Making ..... Oct., 1938
Seed Treatment for Small Grains .. Nov., 1938
Permanent Clovers ..... Nov., 1938
Artificial Drying of Roughage .... Nov., 1938
Story of Yorkwin Wheat ..... Nov., 1938
Made-to-Order Corn ..... Nov., 1938
Nutrients, Not Tons per Acre .... Nov., 1938
When Wheat Follows Soybeans ... Nov., 1938
Streamlining a Rotation ..... Nov., 1938
Clover Farmer ..... Dec., 1938
Flax as a Gulf Crop ..... Dec., 1938
Winter Barley ..... Dec., 1938
Innoculation for Legumes ..... Dec., 1938
When Buying Hybrid Corn ..... Dec., 1938
Good Crop for Low Land ..... Dec., 1938
Birdsfoot Trefoil ..... Dec., 1938
New Blight-Resistant Milo ..... Jan., 1939
Sea Island Cotton ..... Feb., 1939
Fighting Stem Rust ..... March, 1939
Seed Treatment ..... March, 1939
High Quality Roughage ..... March, 1939
High Quality Alfalfa ..... March, 1939
Hybrid Grain Sorghum ..... March, 1939
Growing Grass for Seed ..... March, 1939
Grass and Clover Seed Cost Money April, 1939
Depth of Moisture and Yield of Wheat, May, 1939
Chemistry Weeds the Oats ..... June, 1939
Prussic Acid in Sorghum ..... June, 1939

**Dairy Cattle**

New Treatment for Mastitis ..... May, 1938
Danish Dairying ..... June, 1938
Plan for Livestock Improvement ... June, 1938
High or Low Pressure Dairying ... June, 1938
Feeding Experiments ..... July, 1938
Artificial Breeding Society ..... July, 1938
Why Cows Leave Home ..... Sept., 1938
Breeding Dairy Cattle ..... Sept., 1938
Way to Stop Milk Flow ..... Oct., 1938
What Happens to Herd Sires ..... Oct., 1938
Dairy Experiments ..... Oct., 1938
Minerals for Dairy Cattle ..... Nov., 1938
Why Some Calves Die Young ..... Nov., 1938
Artificial Insemination Progress ... Dec., 1938
She Lost Two Quarters, But .... Jan., 1939
Improving the Curd Size of Milk . Jan., 1939
Milking Shorthorn Cow ..... Jan., 1939
Bang's Disease ..... Jan., 1939
Blood Transfusions for Calves ..... Feb., 1939
Brown Swiss Cattle ..... Feb., 1939
Taking the Bull Visiting ..... Feb., 1939
Calf Raising Problems ..... Feb., 1939
Trim Your Bull's Feet ..... Feb., 1939
Milk in Gallon Jugs ..... March, 1939
Cleaning Gutters No Chore ..... March, 1939
Good Doers Make Good Milkers .. April, 1939
Medal Sire Cost $52.50 ..... April, 1939
Inheritance of Milk Secretion ..... April, 1939
Selection of a Herd Sire ..... April, 1939
Artificial Breeding Results ..... May, 1939
Some Like It Hot—Some Like It Cold, May, 1939
Sex-Predetermination Experiments . June, 1939
Improving Milk Color ..... June, 1939

**Farm Machinery**

Winter Gas Engine Troubles ..... Feb., 1938
Tractor Costs Then and Now ..... Feb., 1938
Tractor Care ..... May, 1938
Types of Pumps for Farm Use .... July, 1938
Hay Choppers ..... Sept., 1938
Lubricating Oil ..... Oct., 1938
Increasing the Farm Water Supply . Oct., 1938
History of Farm Implements ..... Nov., 1938
The Combine Harvester ..... Jan., 1939
Short Cut in Liming ..... Jan., 1939
Anti-Freeze for Tractor Tires ..... Feb., 1939

**Fruit**

Re-evaluating the Dwarf Fruit Tree Feb., 1938
Pollination of Fruit Trees ..... March, 1938
Peach Mosaic ..... March, 1938
The Man Behind the Spray Gun .. April, 1938
Raspberry Varieties ..... April, 1938
New Manchu Apricots ..... May, 1938
Alternate Bearing ..... May, 1938
New Varieties of Tree Fruits ..... June, 1938
New Aspects of Fertilization ..... June, 1938
Orchard Irrigation ..... July, 1938
Raising Quality Fruit ..... Sept., 1938
How to Grow Bush Fruits ..... Oct., 1938
Late Keeping Grapes ..... Oct., 1938
Too Many Bruised Apples ..... Oct., 1938
Peach Progress ..... Nov., 1938
Use of Peat Moss in Planting Trees Dec., 1938
Incubator Fruit Trees ..... Dec., 1938
Citron Being Produced ..... Dec., 1938
Cover Crop for Orchards ..... Jan., 1939
Profitable Pruning ..... Feb., 1939
Dwarf Fruit Trees ..... Feb., 1939
Peach Orchard Development .... March, 1939
Transporting Trees When in Leaf . March, 1939

# INDEX


New Chemical to Control Peach Borer, April, 1939
Fighting Fire Blight ..... April, 1939
Wound Protectants ..... April, 1939
Fertilizing for Fruit ..... May, 1939
How to Save Girdled Apple Trees .. May, 1939
New Method of Apple Propagation .. May, 1939

**Fertilizers**

Mixing Your Own Fertilizers ..... April, 1938
Fertilizer Placement ..... May, 1938
Fertility Loss Must Be Figured ... May, 1938
Small Tonics Increase Yields ..... June, 1938
Phosphatic Fertilizers ..... July, 1938
Fertilizers for the Dairy Farm .... July, 1938
Drilling Fertilizer ..... Sept., 1938
What Are Fertilizers? ..... Sept., 1938
Humus and Fertilizers ..... Sept., 1938
Your Soil's Limiting Factors ..... Oct., 1938
Soil, Fertilizer Action and Plant Nutrition, Oct., 1938
Functions of Organic Matter ..... Oct., 1938
Where to Place Fertilizers ..... Jan., 1939
Boron Deficiency Becomes a Problem Jan., 1939
Keep Manure Piles Wet ..... Jan., 1939
Production of Artificial Manures .. Jan., 1939
Balanced Plant Nutrition ..... Feb., 1939
Fertilizers for Soybeans ..... March, 1939
Getting the Most out of Nitrogen . March, 1939
Side Placement of Fertilizer ..... April, 1939
Fertilized Ponds Produce More Fish . May, 1939
Where to Put Fertilizer ..... June, 1939

**Hogs**

No Pig Wants to be a Runt ..... June, 1938
Pigs, Pasture and Protein ..... July, 1938
Thrifty Pigs ..... Sept., 1938
Pork-Makers ..... Oct., 1938
Bacon for Breakfast ..... Nov., 1938
Selling on Carcass Grade ..... Dec., 1938
Feeding and Fattening Hogs ..... Jan., 1939
New Hog Method ..... Feb., 1939
Protein Supplements ..... Feb., 1939
Tether System of Pig Breeding .... Feb., 1939
Methods Employed in Swine Breeding, March, 1939
Pre-Farrowing Management ..... April, 1939
Ton of Pork Twice a Year ..... April, 1939
Isolation—Insulation ..... May, 1939
Worms, Lice and Mange ..... May, 1939
Marketing and Hog Cycles ..... June, 1939
A Test for Sows ..... June, 1939
Hog Cholera ..... June, 1939

**Horses**

That Dread Horse Disease ..... April, 1938
Minerals and Good Horses ..... July, 1938
Home-Grown Power ..... May, 1939
Handling the Draft Stallion ..... May, 1939

**Pastures**

Seeding Permanent Pastures .... March, 1938
Improving Depleted Ranges ..... April, 1938
Pasture Improvement ..... May, 1938
New Models in Pasture Plants .... May, 1938
Longer Grazing Seasons ..... June, 1938
Restoring the Range ..... Sept., 1938
Anthrax ..... Nov., 1938
By-Products Profits ..... Dec., 1938
Ultra Violet Lamps for Poultry .... Dec., 1938
Keep Your Litter Dry ..... Dec., 1938
Developing Pastures in Florida .. March, 1939
More Grass for Dairy Cattle ..... April, 1939
Deferred System with Rotation Pasture, April, 1939

**Poultry**

Internal Quality of Eggs ..... May, 1938
These Frozen Eggs ..... May, 1938
Battery Brooding ..... June, 1938
Individuality Among Hens ..... June, 1938
It Pays to Insulate ..... June, 1938
Milk Increases Turkey Profits .... June, 1938
Manganese Prevents Slipped Tendons, July, 1938
Ventilation for Poultry Houses .... July, 1938
Culling Cuts Costs ..... Sept., 1938
Is Chick Sexing a Luxury ..... Sept., 1938
Stop Coccidiosis ..... Sept., 1938
White Oak Quail Farm ..... Oct., 1938
Progress in Poultry Feeding ..... Oct., 1938
Artificial Lights for Poultry ..... Oct., 1938
Why Do Chickens Lay Such Eggs . Nov., 1938
At the Finish ..... Nov., 1938
Eggs and Vitamins ..... Nov., 1938
No Monopoly on New Ideas ..... Nov., 1938
Profits from Smoked Turkeys ..... Jan., 1939
Crossbreds Win Acceptance ..... Jan., 1939
More and Better Poults per Breeder . Jan., 1939
How Thick Whites Get That Way .. Feb., 1939
Heredity and Environment ..... Feb., 1939
Influence of the Hatching Date .... Feb., 1939
Turkey Incubation Goes Commercial Feb., 1939
Preventing Coccidiosis ..... March, 1939
Prolapse and Pickouts ..... March, 1939
Baby Capons ..... March, 1939
Geese as a Sideline ..... March, 1939
Egg Auctions Prove Their Value . April, 1939
Count Your Chicks Before They Hatch, April, 1939
Virginia State Game Farm ..... April, 1939
Force Molting of Hens ..... May, 1939
Grass Plus Grain for Poultry ..... May, 1939
The Nittany Turkey ..... June, 1939
Better Range Management ..... June, 1939
Ducklings on the March ..... June, 1939

**Sheep**

Protect Your Sheep ..... Sept., 1938
Make Lambs Market Toppers .... Oct., 1938
Feeding and Breeding for Market .. Nov., 1938
Sweet Potatoes for Sheep ..... Dec., 1938
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